DOCUMENT RESUME

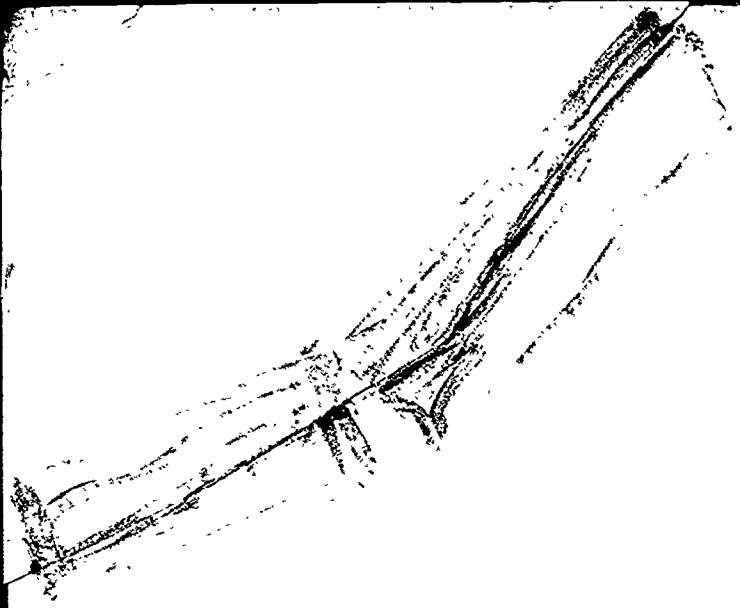
ED 288 361 FL 017 001

AUTHOR Clark, Eve V., Ed.; Holden, Gary, Ed.
TITLE Papers and Reports on Child Language Development, Volume 26. Proceedings of the Child Language Research Forum (19th, Stanford, California, April 3-5, 1987).
INSTITUTION Stanford Univ., Calif. Dept. of Linguistics.
PUB DATE Aug 87
NOTE 139p.; For individual papers, see FL 017 002-015.
PUB TYPE Collected Works - Conference Proceedings (021) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC06 Plus Postage.
DESCRIPTORS Adverbs; American Sign Language; *Child Language; Chinese; Discourse Analysis; *Grammar; Individual Development; *Language Acquisition; Listening Habits; *Morphology (Languages); Parent Child Relationship; *Phonology; Pronouns; Second Language Learning; Spanish; Stress (Phonology); Tenses (Grammar); Uncommonly Taught Languages; Verbs; Vocabulary Development
IDENTIFIERS Reflexives

ABSTRACT

Presented is a collection of 14 conference papers on various aspects of child language acquisition. Papers and authors include: "Language and Psychological Development" (Jean Berko Gleason); "Regression in the Phonological Development of Two Children" (Ken M. Bleile, J. Bruce Tomblin); "Children's Acquisition of the Locality Condition for Reflexives and Pronouns" (Yu-Chin Chien, Kenneth Wexler); "Fast Mapping of Novel Words in Oral Story Context" (Elizabeth R. Crais); "Telegraphic Speaking Does Not Imply Telegraphic Listening" (LouAnn Gerken); "The Acquisition of Word Stress Rules in Spanish" (Judith G. Hochberg); "Conjunction in Children's Discourse" (Zofia Laubitz); "Vocal Motor Schemes" (Lorraine McCune, Marilyn Vihman); "Time-Binding in Mother-Child Interactions: The Morphemes for Past and Future" (Ernst L. Moerk, Rosa M. Vilaseca); "Phonological Perception of Early Words" (Karen E. Pollock, Richard G. Schwartz); "The Conceptual Origins of the Transitive/Intransitive Distinction" (Matthew Rispoli, Lois Bloom); "Private Speech: Second Language Learning During the 'Silent' Period" (Muriel Saville-Troike); "Morphological Innovation in the Acquisition of ASL" (Karen van Hoek, Lucinda O'Grady, Ursula Bellugi); and "Children's Use of the Chinese Adverbial Jiu" (Rosalind Wu). (MSE)



For information, write to:

PRCLD
Department of Linguistics
Stanford University
Stanford, CA 94305

Cheques should be
made out to PRCLD

PAPERS AND REPORTS

ON

CHILD LANGUAGE DEVELOPMENT

Number Twenty-Six

Printed in the United States of America

TABLE OF CONTENTS

Editors' Note

This issue of *Papers & Reports on Child Language Development* contains the proceedings of the Nineteenth Annual Child Language Research Forum, held at Stanford, April 3-5, 1987. We thank all the members of the CLRF committee whose hard work made the Forum possible; Jean Berko Gleason for giving the Keynote Address; Melissa Bowerman and Carol Stoel-Gammon for organizing and leading Special Interest Groups; Brian MacWhinney for giving a demonstration of how to use CHILDES (the Child Language Data Exchange System); and all the participants who contributed so much to making the meeting a success.

Next year's Forum, on **April 8-10, 1988**, will be coordinated by Cheryl Garcia and Yo Matsumoto. The Keynote Speaker will be Charles A. Ferguson. Abstracts (limit 250 words) will be due on January 10, 1988. Abstracts and enquiries should be addressed to Coordinators/CLRF-88, Department of Linguistics, Stanford University, Stanford, CA 94305.

August 1987

Eve V. Clark
Gary Holden

PRCLD 26
1987

Language and Psychological Development

Jean Berko Gleason

Boston University

Developmental psycholinguistics has existed as a recognized separate field of inquiry for about thirty years. During that time, an impressive literature has emerged, documenting children's acquisition of many facets of language. Yet, despite the 'psycho-' in psycholinguistics, the concerns in the field have had mostly to do with linguistics, rather than with psychology. Study of the relationship between psychology and language has been limited primarily to our attempts to determine the psychological processes involved in language acquisition: the role of memory or cognition, for instance. Howard Gardner (1982) lists questions posed by developmental psycholinguistics:

> 'What capacities must the child have in order to master the rules of phonology, semantics, syntax, and pragmatics? How is it possible for the child to master the complex rules of language? Does language acquisition depend primarily on specifically linguistic skills, or does it call upon more general cognitive problem-solving capacities? Is the child innately equipped with fundamental linguistic knowledge, or is language acquisition a matter of starting from scratch?'
> (p. 161)

The role that language plays in psychological development has not been a major concern; American psychology, and, in particular, American psychological theory, has been singularly unaffected by discoveries that to us have been momentous.

Psychology Texts

Developmental psychological theory has remained essentially nonverbal; at the same time, academic psycholinguists, whose research is devoted to verbal issues, are as likely to find themselves teaching in a psychology department as in a linguistics department. This leads to a kind of cognitive dissonance. It is not uncommon, for instance, for a child language researcher to have a teaching load that includes an introductory course in psychology, or a course in developmental, social, or personality psychology as well as a course in language development; the child we are called upon to describe in our psychology course is not the same child that we study in linguistics, and, of course, language development becomes one of many facets of development. Within psychology, the typical introductory text discusses language as part of a chapter on development. Or language may be included in a chapter on language and thought, and some part of the language section may include language development (cf Atkinson, Atkinson & Hilgard 1981).

Textbooks in developmental psychology typically treat language in one of two ways, depending on whether they are chronologically or topically ordered. In the chronological texts, language development is mentioned in several different chapters, for instance early language may be included as part of the section on infancy, and later acquisition may be included with information on development during early childhood. Cognition is treated in much the same way, except that cognitive development is described as well in the teen and adult years, whereas language is assumed to be sufficiently 'developed' by grade school that it needs no further discussion (cf Schell and Hall 1983).

In topically ordered texts, language is frequently the subject of an entire chapter or major section, one that is presented in parallel with units on personality development, sex role development, moral development, and cognitive development (cf Mussen, Conger, Kagan, & Huston 1984).

The role of language in these other spheres, in sex role development and in personality and moral development, is hardly mentioned or considered. In describing cognitive development, for instance, most books now present a Piagetian view in which infants and children progress through four stages: 1.) an early state where knowledge is acquired strictly through physical and sensory input (hence 'sensorimotor'); 2.) the preoperational stage characteristic of the preschool period, in which the child's understanding of the world is basically illogical and egocentric; 3.) a 'concrete operational' stage during the early school years in which the child can understand certain logical relationships, such as the fact that water poured from one glass to another does not change in quantity, even if one glass is much taller than the other. Children in the early grades become concrete operational because they have come to understand such operations as the conservation of liquid just described, as well as another set of basic principles, including class inclusion, seriation, and reversibility, so long as the objects being discussed are physically present (hence 'concrete'); 4) a final stage of cognitive development called 'formal operations', because the young person can now reason hypothetically and perform mental operations, such as algebra, without relying on any concrete objects.

What is perhaps most remarkable about the description of the way that these apparently universal stages evolve is the assumption that they arise out of an interaction with the physical world, as a result of the child's own exploration and experimentation with the world of things. They are nonlinguistic developments. Some researchers have pointed out the ways that language may complicate the demonstration of these abilities by using words such as 'same' and 'different' that preschoolers may not understand, and others have suggested clever research designs meant to get around the problems posed by lack of linguistic knowledge. In general, however, language is given little credit for contributing to cognitive development. (One American exception to the generality is

Jerome Bruner, who has frequently referred to the role of language.) Other areas of development receive similar treatment in developmental psychology texts. Explanations of how children acquire their personalities, their social class attributes, sex role, and moral system are remarkably nonverbal, and depend on a kind of osmosis whereby children 'take on' the characteristics of their parents. There is general agreement that parents are important forces in children's lives, that children early on become attached to their parents and ultimately become like them through a process sometimes called identification and sometimes call imitation, depending on the theoretical school involved, but the way that the parent actually conveys to the child the constructs that are to be taken on is never explicated.

Developmental Theories

Almost every text outlines three or four basic theories to account for the development of major facets of the personality:

1. Biological theory. The individual's genetic endowment, hormones and other innate factors are regarded as the major determinants of personality. Sexually dimorphic behavior, for instance, is produced as a consequence of hormonal influences on receptors in the brain (Money & Ehrhardt 1972).

2. Learning theory. Various forms of learning are invoked to account for the development of observed behavior: classical conditioning, operant conditioning, social learning and imitation. These theories hold that the child comes to take on the appropriate personality and sex role behavior by being rewarded for such behavior or by imitating attractive models (Skinner 1938; Mischel 1976). No inner constructs, such as a moral code or beliefs, are postulated.

3. Cognitive-structural theory. The major determinants of personality are believed to be embedded in the way the individual cognizes the world. The child comes to understand and interpret events, and ultimately, from those insights, comes to act accordingly. For instance, a little boy develops an understanding of the masculine role and of the fact that he is male, and then adapts his behavior and belief system to fit this concept (Kohlberg 1969).

4. Psychoanalytic theory. Personality is formed through a combination of one's genetic endowment ('biology is destiny') and the outcome of a universal family drama. The child goes through various psychodynamic stages: oral, anal, Oedipal, and, finally, genital. Children struggle with their feelings of desire for and fear of their parents and ultimately resolve their conflicts by becoming like their same sex parent (Freud 1957). They become like the parent by incorporating him or her, and, in so doing, acquire the parent's characteristics. Incorporation is a process of internalizing the parent.

Some of the cognitive dissonance mentioned earlier is bound to arise in the psycholinguist who teaches these various theories of child development, while realizing that in our work on language development we describe a quite different human being. Evidence from children's language is not used to support or refute the various theories, and evidence from parent's speech to children is not used to explain how major personality developments are eventuated. If, for instance, children are consumed (sorry) with a desire for food and other objects that can be mouthed, why would their speech at this stage not be dominated by a singularly oral character?

For instance, Freud's oral stage is invoked to characterize the infant up to the age of one and a half or two. According to this view, infants are concentrating their energies on their mouths, on eating and sucking; their oral needs must be satisfied, or they will become 'oral' adults--overeaters, smokers, and so on. (Alas, this also happens if they are too satisfied orally.) Freud's oral infant is the child whom we call Prelinguistic--an infant whose energies are concentrated on establishing communication with others. That greedy oral mouth is busy babbling and then uttering those first words. It is interesting to note that 'kitty' and 'blanket' are as liable to be early words as 'cookie' or something else to put in the mouth; if children's language is a window on their minds, it is odd that early vocabulary has not been analyzed as carefully for its psychodynamic content as for its phonology.

According to psychoanalytic theory, the anal stage follows the oral stage, beginning in the late second or early third year. The child's erogenous zone has moved south, and his or her energies are directed toward sphincter control, and, by extension, physical autonomy. This, of course, is the child we so often think of as being at the two word stage, and linguists have shown that children at that period express many different kinds of intentions (cf Brown 1972). We know that infants are thinking of many kinds of things that are quite removed from toileting activities, yet our insights have not had an impact on the singlemindedness of Freudian theory in this respect.

The penultimate stage of psychodynamic development is referred to as Oedipal, and is thus more applicable to males than to females, but this stage is the point at which, according to the theory, major personality events occur. The child, typically somewhere between four and six years old, is described as torn between a love of the opposite sex parent and, in the case of males, fear of the same sex parent, who is viewed as a powerful rival, capable of delivering terrible punishment in the form of castration. The Oedipal conflict is resolved through identification: the boy child elects to be like his father, and, in so doing, 1) adopts the attitudes, standards, opinions, and behaviors of the older generation and 2) decides to be a male. The Freudian construct of identification is one of the most widely accepted ideas in psychology, and virtually every

theory agrees that the child takes on the characteristics of the parent.Identification is invoked to explain how the child acquires a conscience, a superego, a moral system, and his or her sex role. Psychological health, or lack of it, depends on the successful resolution of this early family drama.

Once the Oedipal crisis is passed, the child's sexuality goes underground during the latency period, then re-emerges in early adolescence. If all has gone well, the young adult's psychosexual stage is now genital and he or she is capable of having a mature relationship with others and of engaging in meaningful work.

Whereas Freudian ideas are widely promulgated and accepted, it is never made clear how the child knows what the parent's moral system is, or how all of those rules of conscience can be internalized unless they have existed in some articulated form. The possibility that parents actually tell children what their moral system is must be considered, but, typically, it is not.

The most widely taught theories in developmental psychology are thus basically nonverbal. They assume that the child acquires the parent's beliefs and values, but they do not explain how the child is able to know the contents of those systems.

By contrast, the Russian psychologist L.S. Vygotsky, is perhaps the major developmentalist who has emphasized the role of language in children's development (Wertsch 1985). One widely used developmental psychology text devotes only two sentences to the work of Vygotsky (Mussen et al 1984, p. 194). Vygotsky and others of the Russian school have seen language as the single most important force in children's psychological development. Vygotsky also looks to internalization to explain psychological development, but, unlike the theorists referred to above, he also invokes a mechanism to explain how the adult's world becomes that of the child. His basic claim is that everything that becomes internal is first external: that children's minds are formed through interaction with others. This implies, of course, that adults actually say aloud the things that children come to internalize.

Vygotsky was much concerned with cognition and cognitive processes, the 'higher mental functions' such as thinking and consciousness for most of his short but remarkably productive life; his theory does not say much about adult influences on children's psychological development in other domains--their affective development and personality growth. These are topics that he began to investigate only toward the end of his life.

Cultural biases

There has been a general reluctance to look at the relationship between language and psychological development because of some biases inerent in our field, and perhaps in our culture: that is, our emphases on cognition and on individuation.

1. The emphasis on cognition over other kinds of development. The Stanford Child Language Research Forum, for instance has included innumerable papers on language and cognition over the years, and there is an honorable tradition in the field of looking to the relationship between them, arguing which is primary, and to what extent they are separate. We are much concerned with the cognitive prerequisites for language. We have no comparable tradition of looking at the relationship between language and affect and language and social development, thus lending a somewhat questionable air to these topics. The prevailing cultural bias in our research is that cognition is an intellectually respectable 'scientific' topic to study, whereas anything of a social nature is 'soft' and, hence, suspect. We might well ask, however: what are the social and affective prerequisites for language? Intelligence alone does not suffice to assure that language will be acquired. Michael Rutter, for instance, claims that autistic children lack the ability to extract social meaning from the world around them, and are not motivated to speak because of their affective deficits, rather than lack of cognitive ability. It now seems clear that cognitive level is not the only determinant of speech, assuming an intact speech system. Many mute autistic children who do not speak have quite adequate cognitive development. On the other hand, many socially oriented children with extremely low IQ do acquire language.

2. Our emphases on individuation. Another reason for our reluctance to look at language and emotional development is perhaps because emotional development is defined mostly through how one relates to others, and our view of linguistic development has been rather like some views of psychological development. Researchers have assumed that development means increasing individuation, an increasing separation of oneself from others. The linguistic view has been that development involves elaborating a set of intentions and learning to express them. The parallel view in psychology is that the individual must first attain his or her individual identity, and only then can intimacy with others be established. Humans, however, have relations with others from the first day of life, and it is clear that one of the functions of language is to help establish and maintain those relations. Because of our cultural bias, we tend to see children as moving toward cognitive and individual goals. Thus, children at the one word stage are described as 'referential' or 'expressive'. In the child language literature, the referential child is clearly regarded as more cognitively oriented, and, thus, superior to the expressive child. This bias toward the 'best and the brightest' is pervasive in our society. Yet it is not clear that the child who is supposedly referential is actually displaying a cognitive drive to name objects in the world. It may be that referential children, like expressivechildren, are motivated above all to maintain the attention, love and approval of their parents, and that naming things accomplishes just those ends with their middle class mothers.

Language has thus not been an important part of psychological theory, which has been elaborated in the absence of real data from developmental psycholingistics. Developmental psycholinguistics, for its part, has devoted far more attention to cognitive correlates of language development than to the ways in which language may interact with the child's social and affective development. As for language addressed to children, our studies of parental input language have concentrated on structural features, rather than content, but there is an accumulating body of evidence that parents' speech may have an impact on children's psychological development.

Input language

In order to understand the possible relationship between language and psychological development, one kind of data that we must examine is the content and nature of parents' speech to children. One obvious way that parents affect their children and their children's language is that they teach them what to say on many occasions; it is not true that children say only those things for which they have developed intentionality. Quite to the contrary, some of the earliest things that children say are said in order to fulfill parental, and hence societal, intentions: greetings, thanks, farewells.

As for the less obvious effects of parent language on children's language, there is, as we all know, a major controversy in our field regarding the effects and non effects of parents' speech. The controversy rages most fiercely around syntax, which, happily, is not the topic here. Parents do explicitly teach some parts of language to children, however, especially many aspects of pragmatics.

In acquiring pragmatic skills children have their own intentions, which they must learn to express in socially appropriate ways; at the same time there are other pragmatic skills that they must acquire in order to be acceptable in society whether they possess the underlying intentions or not. Our own work has shown that routines are regularly explicitly taught by parents: such things as greetings, seasonal or holiday formulas, and other 'polite' expressions. We found, for instance, that only 7% of the preschoolers we studied in a laboratory said thanks spontaneously after being given a gift, but that 86% of those that were prompted by their parents (What do you say? Say thank you. What's the magic word?) said thanks after the parental prompt. Becker (1985) has shown that parents actively teach at least 16 different aspects of pragmatics, including rules about turn taking, interruptions, volume, speaking with the mouth full, etc.

Although the foregoing has been a discussion of parents' influence on children's language, the influence is not limited to language; children's ability to use language appropriately

has far reaching effects on their psychological functioning. Parents help children to become acceptably polite people; the child who, for instance, does not produce 'Hi', 'Thanks', and 'Goodbye' when they are called for engenders active hostility on the part of the visiting relative, the friend who brings her a birthday present, or the neighbor who drives the carpool. In teaching the child to be responsive to the linguistic and situational cues that call for various kinds of politeness, the parent is also teaching the child to become aware of the feelings and intentions of others.

In teaching pragmatic skills, the parent also helps the child to become an acceptable conversationalist. There is now a body of research that indicates that the ability to handle these pragmatic features and to perform accurately has far reaching psychological consequences: children who are poor conversationalists in kindergarten become isolated and unhappy; those who are verbally skilled, are far more likely to become leaders, to have high self esteem, and self confidence.

Input language about topics other than language can contain a great deal of material, psychological in nature, that may relate to the child's ultimate psychological development. There are also many kinds of ways that parents' language feeds into children's cognitive development: Catherine Snow (personal communication) has recently, for instance, examined the way parents use the word 'remember' when speaking to their children. She has shown that parents use the word to help children structure their own memorial processes; when they say things such as 'Remember when we went to grandma's?' they help the child to retrieve events from long term memory and to compare them with current information. When they use it in the future, ('Remember, we are going to grandma's next Sunday') they help the child to develop an understanding of the sequential structure of time.

The content of parents' speech to children can also be examined for insights into other aspects of children's psychological development, and for evidence that in the Vygotskyian sense the features of personality of the child that are internalized are actually first made explicit externally by the parent in the parent's speech. If this is the case, then we need not believe in obscure and magical processes whereby the child 'incorporates' the parent; it suffices to internalize the message that is carried in the parent's language. This, of course, presupposes a child who is disposed toward the parent, a child who is motivated to interact with and be rewarded by others.

Sex role development.

One area of psychological development tht I have discussed earlier is that of sex role development. Some interesting recent work has shown that mothers speaking to their infant

daughters use more words relating to feelings and emotion than do mothers speaking to their sons. By the age of two, reliably more emotion words appear in the speech of girls than of boys (Dunn, Bretherton & Munn 1987). The possible differences in emotional responsivity between males and females that have been thought to be innate, may thus be structured by the parent; even if there are innate differences between the sexes in this and in other areas, it is clear that parental language can serve to amplify them (or for that matter, to minimize them). In our own laboratory we have found that fathers used more directives with their sons, more threatening language, more jocular names. David Bellinger and I found that fathers use more direct imperatives than mothers and more directives in general, and, although it did not reach significance, boys between the ages of three and five used a pattern of directives that was different from that of girls (Bellinger & Gleason 1982).

Clearly, there are some both subtle and explicit differences in parents' speech to boys and girls. These differences begin to emerge as soon as we look at content, rather than structure, although it is also obvious from the work on directives that syntactic devices associated with masculine or feminine style are also differentially employed. In looking at vocabularly, it is possible to find different emphases in areas other than that of affect, mentioned above. For example, we conducted a brief examination of the transcripts of Brown's subject Adam (2;7 to 3;11) and Sach's subject Naomi (1;6 to 3;8) which are in the Child Language Data Exchange System. We looked at the use of only two words, 'pretty' and 'strong' in these two families. It immediately becomes clear that 'strong' is a very common word used by the little boy and his family, and that 'pretty' is even more frequent in the little girl's family. (The word 'strong' does not appear at all in the first 10 Naomi transcripts, nor in many others.) The word 'pretty' occurs pervasively in the girl's family in respect to the child herself, to clothing, ribbons, flowers. She is even told 'snow, yes, pretty snow' (Naomi 02 1.136). The use of these adjectives may be exaggerated because of different family styles, but it is also true that cultural values about strength for boys and prettiness for girls are conveyed in the parents' language.

General aspects of personality

In addition to information about their sex role, parents also pass on to children a rather complex world view, which then becomes their own. It is of course difficult to specify how and when these things become internalized, assuming that much of it happens through language. We can get a glimpse of the way children acquire some aspects of culture through role play, for instance in Elaine Andersen's (1984) work with puppets. By the age of four or five children have access to a cultural stereotype for various roles: they know that babies say 'goo goo ga ga', and so on. Of course the stereotype is not real world knowledge, but it is evidence that children have internalized the verbal portions of these socially defined roles.

Another window on internalization, and one that is closer to psychological development, can be found in children's monologues. For instance, Ruth Hirsch Weir's famous (1970) volume on crib speech shows that by the age of 27 months her son Anthony, alone in his crib at night, practiced aloud many of the admonishments and other phrases he had heard from adults during the day:

> Don't touch Mommy Daddy's desk
> Don't go on the desk
> Don't take daddy's glasses
> Make it all gone
> That's the boy
> I hope so
> Clean out the drawer
> Excuse me
> (p. 121 & 134)

Our own research has concentrated on 24 families seen at home and in the laboratory; part of the work is aimed at looking at these broader aspects of parental input and the kinds of differences we see among families that might relate to different psychological outcomes in children. For instance, there is a good deal of variation in parent-child conversations along dimensions such as control and the kinds of knowledge parents impart.

For her doctoral dissertation Rivka Perlmann (1984) coded conversational topics at dinner along a continuum of focus ranging from most immediate to most general and abstract--categories that ranged from eating and keeping clean to talk about people and places one had seen that day, and finally, at the most abstract level, to general principles about how the world works. All families talked about immediate concerns, which occupied about half of all conversations; some families also talked about non-immediate concerns and about general principles.

What emerged as most interesting was that when we looked at measures of control in the parents' speech as well as measures of focus, a negative correlation was observed: the more directive the parents were in their speech to children, the less likely they were to provide information about the world in general, to play with language, or to talk about topics removed from the immediate situation. The examples of family conversation included here are provided by families with very different styles, even though the goal of both sets of parents is the same: to get their young son to eat the main course before eating dessert. There is clearly a marked qualitative difference between them: Frank's family conversation is centered on discipline and control whereas Charlie's family conversation is much less directive, is clearly playful, and provides world knowledge.

Two Family Conversations (from Perlmann, 1984)

(Frank's family)
Mother: Now I'm going to cut your roast beef, honey.
Child: I don't want to eat it.
Mother: Well, I thought you liked roast beef!
Child: I'm not going to eat it.
Mother: Why not?
Child: I'm too full.
Mother: Well, you eat what you drink, see? Okay if you don't eat this roast beef you have no more twinkies. You understand that?
Child: I'll eat one.
Mother: No, you'll eat half of it. I'll cut this much off.
Father: You just take it.
Child: This much.
Mother: Now, and if you do not ...
Child: Not that.
Mother: Frank, if you do not eat every bite of that you'll never buy a twinkie again. I'm telling you. I let you have half of it and this is my reward.
Child: You're so mean. If I'm full can I stop eating it?
Father: You taste it. It's very good.
Mother: You must eat some of this amount that I'm cutting up.
Child: What if I'm too full?
Mother: Well, you can eat it I'm sure. You chew it good.
Child: [whining and mumbling something unintelligible]

(Charlie's family)
Mother: Hey, Charlie? Come give one more try and then we'll have some dessert?
Child: No!!
Mother: Okay.
Child: I don't like it [whining]
Mother: Is it so hard, sweetie? How 'bout ... I'll tell you what, I'll make a switch with you.
Child: What?
Mother: Will you have a piece of turkey? Piece of chicken?
Child: No.
Mother: Like your sandwich.
Child: No, I wanna have cake first.
Mother: No, you can't have cake until you have something healthy. Cake is delicious, but you have something healthy first. I'll show what I'll give you instead. How's that?
Child: What?

Mother: Watch this.
Child: No, I like cake.
Mother: Oh, you can have cake too!
Child: What's in there? [mother in another room]
Mother: Will you eat a piece of this? [corn]
Child: No!
Mother: Okay, then no cake.
Child: But mom, I want cake!

* * *

Child: I want some corn.
Mother: There's a boy. Well, you can pick up the fork when you're ready, okay?
Child: I'm ready.
[Father laughs]
Mother: There's the man.
Father: But be careful, son. You're gonna get it on the rug. There you go.
Mother: A triumph, Charlie.
Child: I ate some corn.
Mother: That was a brave thing to do.
Child: Why?
Father: 'Cause that will guarantee you a place in hea ... a place in heaven and a piece of cake.
Child: It will not.
Father: There you go. See that corn right there?
Child: Yeah.
Father: Let's try and clean that up.
Mother: Can you do that by yourself?
Child: I'm trying.
Father: That's the way Japanese people eat rice, Charlie. Shove it off the side of the plate.
Child: Now can I have some cake?

In terms frequently used in the child development literature, these parental styles are called authoritarian (Frank's) and authoritative (Charlie's); many studies, moreover, have correlated children's personalities with the kind of parenting style they have been exposed to. What has not been hitherto clear, is that these important dimensions of parental style are verbal dimensions: they are dimensions of input language.

Conclusions

I have been trying to suggest here that input language may have a far reaching effect on child development, well beyond any effects it might have on language development per se--that language is the medium whereby children acquire at least a portion of their sex role and social class or group characteristics as well as their world view, their emotional and psychological well being. This is not to deny the existence of inborn temperamental and intellectual qualities that are also important.

Obviously, parent behaviors as well as words also make a difference, but if we return to the developmental psychological literature it becomes clear that the basic theories, with the exception of Vygotsky's, are defective because they ignore language. A large body of research in child development tries to correlate parent behaviors and child outcomes. Mostly, this has been along the dimensions of warmth and coldness, permissiveness and restrictiveness. Children who are socially and emotionally competent tend to have authoritative parents. Children of authoritarian parents are more likely to have negative personality traits. Research on parents' language gives substance to the rather subjective terms 'authoritarian' and 'authoritative'. To be authoritarian means to use a particular verbal style: authoritarian parents provide many controlling statements and little general world knowledge to their children. Authoritative parents appear to be more emotionally responsive to their children--their explanations avoid direct orders and offer more world knowledge. Even in a subset of families from a fairly homogeneous community in Boston we find these differences in parents' verbal style.

At a more microscopic level, we can see in parent-child interchanges such phenomena as different use of adjectives about strength and beauty and about emotional states to boys and to girls. Some earlier work done in our lab by Esther Greif (1980) also showed that parents interrupt little girls more than they interrupt boys, which is interesting in light of the fact that women appear to be interrupted more than men as adults. One can well speculate that being construed as interruptable would have an effect on one's self perception and self esteem.

We obviously need to identify and provide a cohesive framework for the characteristics of parental input that we thing impact upon children's psychological development. Some of

this has already been done: The study by Dunn et al mentioned earlier shows that mothers speak more about emotional states to girls than to boys and that bythe age of two girls are talking more about such states themselves. Recent research by Martin Seligman shows even more far reaching correlations between parental style and children's style; Seligman, cited by Daniel Goleman, found that children provide the same sorts of explanations as their mothers, that is that the tendency to be optimistic or pessimistic, to assume that one has control over aspects of the world, is related to maternal style:

'..researchers have found differences in explanatory style among children as young as the third grade. While there is not yet a firm theory of how people's explanatory styles are shaped, major infuences seem to come from the attitudes of significant adults in a child's life, especially parents and teachers. Two studies comparing the explanatory styles of parents and their children have found that a mother's style, but not the father's, correlates highly with the styles of their children. That pattern suggests that social influence, not heredity, is at play.'

(Goleman 1987)

Explanatory style, in turn, has far reaching implications for health, longevity, and general emotional well being. For instance, people who explain their own failures by blaming themselves have a much greater susceptibility to disease than more optimistic people, are more likely to drink and smoke heavily, and to neglect themselves. They report twice as many colds and doctors' visits a year than those with an optimistic explanatory style.

Returning, then, to psychological theory, it becomes increasingly important to consider the ways that parental linguistic input may contribute to the psychological development of their children. Developmental psychology tells us that young children identify with their parents and take on the sex role and moral system of the parent. Language is used to shape the sex roles of children from their earliest days. We will also understand better what we mean by superego or conscience when we look at what parents are actually saying to children; the child, after all, does not simply impute her parents' moral system. The superego must consist originally of just those parental admonishments that we have begun to document, and which infants as young as two can be heard repeating to themselves in their presleep monologues.

Developmental psychologists recognize that internalization of parental characteristics through identification is a broad and pervasive aspect of the young child's personality development, yet internalization is treated rather as a magical process:

'In fact, many significant and complex patterns ...appear to be acquired by the child spontaneously without direct training or

reward--without anyone's teaching, and without the child's intending to learn.'

(Mussen, Conger, Kagen & Geiwitz 1979 p. 222)

The likely vehicle of transmission of these features of the parents' orientation and value system is the language directed to the child, in which a world view is made explicit. As linguists we have nearly 30 years of data on parent-child interaction which we can use, and should use, to show the crucial role that language plays in psychological development.

References

Andersen, E. S. (1984). The acquisition of sociolinguistic knowledge: Some evidence from children's verbal role play. Western Journal of Speech Communication, 48, 125-144.

Atkinson, R., Atkinson R.C. & Hilgard, E. (1981). Introduction to Psychology. Eighth edition. New York: Harcourt Brace, Jovanovich.

Becker, J. A. (1985). Pragmatic socialization: How parents teach preschoolers pragmatic skills in the home. Paper presented at the Boston University Conference on Child Language; Boston, MA.

Bellinger, D., & Gleason, J. Berko. (1982). Sex differences in parental directives to young children. Sex Roles, 8, 1123-1139.

Dunn, J., Bretherton, I., & Munn, P. (1987). Conversations about feeling states between mothers and their young children. Developmental Psychology, 23, 132-139.

Freud, S. (1957). In J. Rickman (Ed.), A General Selection from the Writings of Sigmund Freud. Garden City, NY: Doubleday.

Gardner, H. (1982). Developmental Psychology. Second edition. Boston: Little Brown & Company.

Goleman, D. Research Affirms Power of Positive Thinking. (1987). New York Times, 3 February.

Greif, E. B. (1980). Sex differences in parent-child conversations. Women's Studies International Quarterly, 3, 253-258.

Kohlberg, L. (1969). Stage and sequence: The cognitive-developmental approach to socialization. In D. A. Goslin (Ed.) Handbook of Socialization Theory and Research. New York: Rand McNally.

Mischel, W. (1976). Introduction to Personality. Second edition. New York: Holt, Rinehart and Winston.

Money, J. & Ehrhardt, A. E. (1972). Man & Woman Boy & Girl. Baltimore: The Johns Hopkins Press.

Mussen, P.H., Conger, J.J., Kagan, J. & Geiwitz, J. (1979) Psychological Development: A Life-Span Approach. New York: Harper & Row.

Mussen, P.H., Conger, J.J., Kagan, J. & Huston, A.C. (1984). Child Development and Personality. Sixth edition. New York: Harper & Row.

Perlmann, R. Y. (1984) Variations in Socialization Styles: Family Talk at the Dinner Table. Unpublished doctoral dissertation, Boston University.

Schell, R. E. & Hall, E. (1983). Developmental Psychology Today. Fourth edition. New York: Random House.

Skinner, B.F. (1938). The Behavior of Organisms. New York: Appleton, Century-Crofts.

Weir, R. H. (1970) Language in the Crib. The Hague: Mouton.

PRCLD 26
1987

Regressions in the Phonological Development of Two Children

Ken M. Bleile
and
J. Bruce Tomblin
University of Iowa

The present study was motivated by the concern that many current models of phonology present an overly deterministic picture of phonological development (Kiparsky and Menn, 1977). Three of the most respected and widely accepted of these models are Jakobson's Structuralist theory (Jakobson, 1968), Generative Phonology (Chomsky and Halle, 1968), and Natural Phonology (Stampe, 1973). Within these theories, determinism takes the form of innate linguistic knowledge. Phonological acquisition is viewed as the unfolding of a genetically controlled program of development (Menn, 1983).

In recent years, investigators have challenged the above conception of child phonology. A principal reason for disenchantment has been the discovery of extensive cross-child variation. Contrary to Jakobson's predictions, children appear to vary in the order in which they acquire feature contrasts (Menn 1976, 1983). Contrary to Natural Phonology, all children do not appear to possess the same set of phonological processes (Edwards, 1979). Generative Phonology's claims are more general, and therefore more difficult to either prove or disprove; nonetheless, the existence of extensive individual differences does not lend support to deterministic claims of the model, the aspect of the theory at issue here.

Given the acknowledged existence of extensive cross-child variation, investigators face the challenge of modeling an acquisition process that is sufficiently flexible to permit variation across all known parameters, but at the same time is sufficiently powerful to bring children to some acceptable variant of the ambient language. Faced with this challenge, some investigators have chosen to work within modified versions of existing theories (Edwards and Shriberg, 1983; Moskowitz, 1970; Smith, 1973), while others have attempted to develop new frameworks (Macken and Ferguson, 1983; Menn, 1983; Schwartz, 1984).

The most widely discussed of the newer approaches is characterized by its emphasis on problem-solving aspects of phonological development. The problem-

solving approach is most fully elaborated in three models: Interactionist-discovery Phonology (Kiparsky and Menn, 1977; Menn, 1976, 1983), Cognitive Phonology (Macken and Ferguson, 1983), and Constructivist Phonology (Schwartz, 1984; Schwartz and Leonard, 1982). In the present paper, the neutral terms "cognitively-oriented" and "problem-solving" will be used when referring to positions held in common by all three models.

A variety of types of evidence have been used to support cognitively-oriented models. Particularly strong support has been found in three areas, (1) the discovery of unusual segment and phonotactic patterns that appear to have arisen from children's attempts to solve phonological problems, (2) phonological selectivity, which appears to be a device that might serve to limit children's attention to a subset of phonological patterns in the ambient language, and (3) non-adult units of phonological organization, which appears to indicate children do not automatically have adult phonological parameters available to them.

The above classes of empirical data have served to establish the credibility of non-deterministic accounts. However, Macken and Ferguson (1983) and Menn (1983) have both contended that the strongest support for such theories may come from apparent regressions in phonological development, if such regressions can be shown to be the result of hypothesis testing on the part of children.

At present, few phonological analyses of regressions have been reported. Pioneering research and analysis appears in Menn (1976). Other well-known examples appear in Leopold (1947) and Smith (1973). Recently, Vihman and Velleman (pers comm.) have begun studying the phenomenon in children's earliest vocabularies. Phonological regressions reported in the literature appear to be of two general types: incorporation of isolated lexical items into the child's phonological system, as occurred in the oft-cited example of "pretty" in Leopold (1947), and rules reorganizing phonologically-defined classes, as appears to be the case with data presented in Menn (1976).

All agree that more data on phonological regressions are needed. The present paper attempts to address this research issue through longitudinal analyses of the phonologies of two children. The specific research question addressed is, do phonological regressions exist in the speech of the children?

Methods

The subjects were two children named Kylie and Jake. Table 1 presents background information on both children. Both children were raised in monolingual environments by caregivers who spoke Midwestern American English. Both subjects were in good health during the course of the study. Each subject was observed 3 times a week for 8 weeks. Individual sessions ranged from 3-4 hours. All observations were undertaken in the children's homes. The investigator brought the same set of toys to each session, and efforts were made to elicit words represented by the objects on a regular basis. Data were collected while playing, reading books, and during snacks.

Phonologically, Kylie's consonant inventory contained stops, nasals, anterior fricatives, [h], and glides. No type of consonant cluster occurred in three or more different words. In stressed syllables, kylie's phonology contained all the vowels of English, except those with r-coloring, which were completely absent. In unstressed syllables, her phonology showed the expected large number of neutralizations of vowel contrasts. Jake's surface inventory was similar to Kylie's, except for the presence of some additional affricates and consonant clusters.

To obtain a measure of phonological development during the period of the study, words produced in both the first and last five sessions were analyzed. For Kylie, 42% of these words contained phonological changes, mostly in the areas of consonant clusters and syllable-final consonants. In sharp contrast, only 3% of Jake's words showed such changes. An implication of this finding is that the period of the investigation involved relatively extensive phonological growth for Kylie, but not for Jake.

All productions were recorded on a Sony Cassette tape recorder using ZT microphones. Based on transcription from tape recordings, Intra-judge and inter-judge reliability, averaged over a variety of phonetic environments was, respectively, 96% and 87% for Kylie and, respectively, 96% and 89% for Jake.

Prior to analyses of regressions in the children's vocabularies, attempts were made to develop minimum criteria to help distinguish between regressions due to cognitive factors and those that might possibly due to non-cognitive influences. This was done to limit the analysis to the stronger examples. In addition to hypothesis-testing, possible sources of surface regressions were thought to be the collapsing of data that included spontaneous single words, sentences, and

Table 1. Basic statistics for the subjects (Kylie and Jake) in the investigation

	Kylie	Jake
Age	1;10:0-2;1:02	2;0:11-2;2:3
Siblings	2	none
ages	9 months 6 years	-
Parents	both natural parents	both natural parents
occupations	housewife student	students
Principle interactor during study	mother	father
M.L.U.	1.43	2.2
Hearing	speech: 10 dB warble: 15 dB	speech: 15 dB warble: 20 dB
M.P.D.I.[1]		
Gen. Devel.	2;1	2;6
Gross Motor	1;10	2;6
Fine Motor	2;6	2;7
Express. Lang.	2;1	2;8
Comprehension Conceptual	2;2	2;6
Comprehension Situation	1;9	2;6
Self Help	1;9	2;6
Personal-soc.	1;9	2;0

[1] - Minnesota Preschool Developmental Inventory

imitations and repetitions. Other less cognitive sources could be random phonetic variation and variation in language input to the subjects.

To remove the most obvious cases of regressions due to the above factors, data were limited to spontaneous single words not the result of imitation (operationally defined as five or fewer seconds between an adult model and a child's utterance) or repetition (operationally defined as less than ten seconds between a child's production of the same word. In the case of repetitions, only the first production was included in the data.). The most obvious instances of phonetic variation were removed by requiring potential regressions to be produced without phonetic variation in the parameter of interest on at least three occasions in both the pre-regression and regression stages.

Results

Even after imposing the above fairly stringent criteria, data from both subjects were found to contain developmental regressions. Kylie's data yielded four rules that produced regressions, and Jake's data yielded another three. Two of Kylie's rules serve to illustrate the general form of her productions. Discussion of one of Jake's rules will serve to illustrate the general form of his productions.

Kylie

Kylie's first rule involved Velar Regression. The rule operated in word-initial [+ stress] environments, turning velars into alveolars. As background for the rule, at the beginning of the study, in word-initial [+stress] environments Kylie produced adult-language velars in three ways, as velars, alveolars, and labials. The latter occurred in consonant clusters when the second C was [r]. In all other positions, adult language velars were almost always produced as velars, except under specific assimilation conditions.

The rule that led to Velar Regression operated on all velars that met the it's description. This included eight words, "Cookie Monster," "clown," "ok," "kitty cat," "cow," "cookie," "ice cream," and "Gumbi." "Cookie Monster," "clown," and "ok" met the numerical criteria established prior to the study to be labelled regressions. Table 2 charts the developmental course of word-initial velars in these words. Session numbers appear along the left and words involved in the regression appear along the top.

Table 2. Kylie's productions of [k] in "Cookie Monster," "clown," and "ok" indicating number of tokens occurring in each session

Session	Word	Tokens	Word	Tokens	Word	Tokens
	Cookie Monster		clown		ok	
1.	-		k	2	k	1
2.	k	2	k	2	k	2
3.	k	3	-		k	3
4.	-		~~k~~t	1/2	-	
5.	k	1	-		-	
6.	-		t	4	k	1
7.	k~t~p	1/2/1	t	1	t~d	1/2
8.	p	1	t	3	t	1
9.	t	3	k	1	t	1
10.	k~t	1/2	t	5	t	1
11.	t	1	t	3	t	1
12.	t	1	t	1	-	
13.	-		t	2	-	
14.	-		t	2	t	3
15.	t	2	t	1	t	1
16.	t	1	t	1	-	
17.	t	1	-		t	2
18.	t	1	-		t	1
19.	-		-		t	1
20.	t	1	t	3	t	1
21.	-		-		t	1
22.	t	1	t	2	t	1

All words undergoing rule: Cookie Monster, clown, ok, kitty cat, cow, cookie, ice cream, Gumbi

Table 3. Kylie's lexical entries for "frog" indicating number of times the word was produced per session

frog	fɔt/fɔg/fɔ	(6) 1/1/1
	fɔ/fɔg	(7) 1/1
	fɔ	(8) 1
	fɔg/fɔ/fɑg	(9) 1/1/1
	fɔg	(11) 1
	fɔg	(12) 1
	fɔg/fɑg	(13) 4/1
	fɔ̂g	(15) 4
	fɔ,g/fɔgi	(16) 1/1
	fɔg	(17) 1
	fɔg	(18) 1
	fɔg	(19) 1
	fɔg	(20) 1
	fɔg/fɔ	(21) 2/1

All words undergoing rule: frog, flag, scared, pig, cold, bug, outside, swing

As the table indicates, the pre-regression stage for all three words occurred during the first two to three weeks of the study. During this period, six occurrences of word-initial velar in "Cookie Monster" were recorded. During the same period, four productions of [k] in "clown" and seven productions of velar in "ok" were obtained.

Reading left to right across the table, for "Cookie Monster" the regression began in session seven, when word-initial [k] began to alternate with [t] and [p]. [p] for adult-language [k] was highly atypical for Kylie. However, Kylie regularly produced adult-language C + [r] clusters as labials. For "clown," the regression began in session four, when [k] was replaced with Ø or [t]. Ø for word-initial [k] (or any consonant other than [h]) did not occur anywhere else in Kylie's data. For "ok," the regression began in session seven. [d] for [k] was produced in an inter-vocalic environment. Voicing was a minor process for Kylie in that position.

I interpret the child's unusual patterns of variation at the time when the regression began as attempts to find new ways to produce the words. After the initial phonetic instability, throughout the remainder of the study word-initial velars were regularly produced as [t]. Two weeks after completion of the study, I returned to see the subject. During this visit, I was able to elicit a number of words that contained initial velars in the adult language, including "clown." All were pronounced with velars by the child, suggesting that the regression stage had ended and the post-regression stage had begun.

Kylie's second rule added a schwa to words ending in voiced oral stops. The schwa induced resyllabification. The rule was operative in Kylie's phonology for approximately two weeks. During that period, eight of the twelve words that met the rule's description showed the pattern. The words were "frog," "flag," "scared," "pig," "cold," "bug," "outside," and "swing." "Frog" met the numerical requirement necessary to be labeled a regression. Table 3 lists the developmental course of this word. In this and the next table, the variants of words appear on the left, session numbers appear in parentheses, and number of tokens of variants appears between slahses.

As the table indicates, up till session fifteen "frog" was a one syllable word that ended with [g] or Ø. Sixteen tokens of this word were recorded. In session fifteen, "frog" became [fɔ́gə] for four productions. In the post-regression stage, "frog" again became a one syllable word. Eight productions of

Table 4. Jake's lexical entries for "orange" indicating number of times word was produced per session

orange	ɔIns/ɔInz	(1)	2/2
	ɔ́Ins	(2)	1
	ɔIn/ɔIns	(3)	1/1
	ɔ́I.Ins	(4)	1
	ɔ́I.In	(5)	1
	ɔ́I.Ins	(8)	2
	ɔwIns	(9)	2
	ɔ́I.Ins	(10)	1
	ɔ́wIns	(11)	4
	ɔ́IyIns	(13)	1
	ɔ́Iyɛns	(15)	1
	ɔIyɛns	(16)	1
	ɔ́Iyɛns/ɔIyɪnz	(18)	2/1
	ɔ́I.yɛns	(19)	1
	ɔ́I.yɛns	(20)	1
	ɔ́I.yɛns	(21)	4
	ɔI.yɛns	(22)	1

the post regression behavior were recorded. In common with "frog," the seven other words that underwent the rule were produced as two syllable words during the period of the regression, and before and after the regression were always produced as one syllable.

Jake

While Kylie's regressions appeared to operate on classes of sounds, Jake's always involved incorporation of isolated words. The word "orange" illustrates the pattern. This word was pronounced [ɔrndʒ], by those adults with whom Jake came in contact. The regression involved loss of ability to say the word as a monosyllable.

Table 4 lists the developmental course of the word. As the table indicates, during the first week and one-half of the study (sessions 1-3), "orange" was produced on seven occasions as a one syllable word. For the remainder of the study, on [illegible] occasions the word was pronounced with two syllables. No one-syllable productions were recorded. [w] was the onset of the second syllable when the vowel in the first syllable was [ɔ], and, beginning in session 13 [y] was the onset of the second syllable when the vowel in the first syllable ended with a high front off-glide. It is relevant that elsewhere in Jake's phonology, syllables ending in the diphthongs [ɔI] and [aU] were regularly resyllabified, so that, for example, "boy" was pronounced [bɔ́Iyə] and "pow" was pronounced [páUwə].

Discussion

As mentioned earlier, Kylie possessed four rules that led to phonological regressions, and Jake possessed three. All of Kylie's regressions involved rules that operated on phonologically defined classes. Each of Jake's regressions operated on specific lexical items.

As regards Kylie's rule of Velar Regression, I speculate the rule may have arisen as an attempt by the child to reduce the number of different places of articulation. In the pre-regression stage Kylie had several ways to produce adult-language velar stops in word initial environments, as labials (in [r] clusters), alveolars, and velars (in a few singletons and clusters). As the regression began, the child experimented with several unusual pronunciations, and then settled on the constraint dominate in her

phonology: velar → alveolar. Similarly, near the same time, all velar + [r] clusters became labials.

The effect of the regression was to reduce the number of places of articulation that Kylie needed to produce in what was for her an important phonological environment. Finally, the post-regression stage, which began after completion of the study, appears to represent the child's recognition that the treatment of place of articulation was too undifferentiated for the language being acquired.

A similar interpretation might be given Schwa Addition. However, a difference between the rules is that the Schwa Addition rule did not exist prior to the regression. A possible interpretation of the rule is that it involved an attempt by Kylie to control voicing on obstruents in word-final environments. An interesting developmental question is whether the voiced obstruents in the pre and post regression stages had the same acoustic characteristics. Unfortunately, acoustic data were not collected as part of the study.

As regards Lexical Incorporation, the regression apparently arose from extension of an existing resyllabification rule. This rule extension may have functioned to permit Jake to produce a relatively complex phonetic sequence in "orange" by inserting a vowel between the diphthong and the nasal.

Conclusions

The most specific implication of the study is that for the subjects phonological development was not a succession of steps, each bringing the learner closer to the ambient language. Rather than being incremental, regressions led to periods in which the children's ability apparently decreased relative to earlier stages.

The children's regressions are in accordance with basic tenets of cognitively-oriented models. As stated in several places, such models emphasize the role of children's rule discovery abilities as factors in phonological development. Given this emphasis, it is incumbent on the theories to demonstrate that children possess sufficiently active cognitive processes to discover regularities in the ambient language. Apparent phonological regressions, when they plausibly can be shown to have arisen from hypothesis testing activities, provide dramatic evidence that children possess the ability to discover patterns, and that they will implement rules even at the expense of surface phonetic accuracy.

References

Chomsky, N. and Halle, M. (1968). Sound pattern of English. New York: Harper and Row.

Edwards, M. (1979). Phonological processes in fricative acquisition. Papers and Reports in Child Language Development, 17, 98-105.

Jakobson, R. (1968). Child language, aphasia, and phonological universals (A. Keiler, trans.). The Hague: Mouton.

Kiparsky, P. and Menn, L. (1977). On the acquisition of phonology. In J. Macnamara (Ed.), Language learning and thought. New York: Academic Press.

Leopold, W. (1947). Speech development of a bilingual child: a linguist's record. Chicago: Northwestern University Press.

Macken, M. and Ferguson, C. (1983). Cognitive aspects of phonological development: model, evidence, and issues. In K. Nelson (Ed.), Children's Language, V. 4. Hillsdale, New Jersey: Lawrence Erlbaum Associates, Publishers.

Menn, L. (1976). Pattern, control, and contrast in beginning speech: a case study in the development of word form and word function. Ph.D. dissertation: Urbana: U. of Illinois.

---- (1983). Development of articulatory, phonetic, and phonological categories. In B. Butterworth (Ed.), Language production. New York: Academic Press.

Moskowitz, B. (1970). The two-year-old stage in the acquisition of English phonology. Language, 46, 426-441.

Schwartz, R. (1984). The phonologic system: normal acquisition. In J. Costello (Ed.), Speech disorders in children. San Diego: College-Hill Press.

Schwartz, R. and Leonard, L. (1982). Do children pick and choose? An examination of phonological selection and avoidance in early lexical acquisition. Journal of child language, 9, 319-336.

Smith, N. (1973). The acquisition of phonology: a case study. New York: Cambridge University Press.

Stampe, D. (1973). A dissertation on natural phonology. Ph.D. dissertation: Chicago: University of Chicago.

Vihman, M. and Velleman, S. (1986). Informal report at Midwestern Conference on Child Phonology. University of Indiana, Bloomington; May.

PRCLD 26
1987

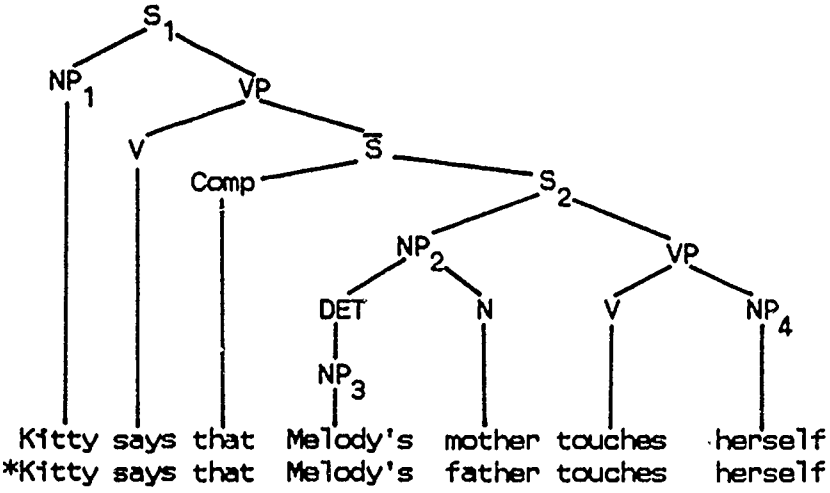
CHHILDREN'S ACQUISITION OF THE LOCALITY CONDITION FOR REFLEXIVES AND PRONOUNS

Yu-Chin Chien and Kenneth Wexler
University of California at Irvine

In this paper, we present three experimental studies which are designed to reveal the development of two important concepts, namely the antecedent possibilities for reflexives (e.g., himself or herself) and pronouns (e.g., him or her). These two concepts are relevant to the universal Binding Principles A and B involved in the Government and Binding theory proposed by Chomsky (1981). In Wexler & Chien (1985), Binding Principle A is informally redefined as following: "a reflexive must be locally bound". Three crucial structural properties are involved in this definition. The reflexive must have an antecedent, this antecedent must be local, and it must c-command the reflexive.

Sentences (1) and (2) and the corresponding phrase-marker (3) illustrate the three structural properties.

(1) Kitty says that Melody's mother touches herself.
(2) *Kitty says that Melody's father touches herself.
(3)



In sentences (1) & (2), there are three possible antecedents for the reflexive "herself". They are (NP_1) "Kitty", (NP_2) "Melody's mother" (or "father"), and (NP_3) "Melody". By applying a simple definition of c-command and a simple definition of locality, as stated in (4), to the structural configuration (3), we find that only "Melody's mother" (or "father") locally c-commands the reflexive "herself". "Kitty" is not a local antecedent.

(4) C-Command: In a phrase-marker, node A c-commands node B if and only if the first branching node which dominates A also dominates B.
Locality: (for our purposes here) in the same clause as.

Sentence (1) is grammatical because the antecedent which locally c-commands the reflexive (i.e., "Melody's mother") has the same gender as the reflexive. Sentence (2), is ungrammatical because the local antecedent "Melody's father" does not carry the same gender as the reflexive "herself", so there is no antecedent for "herself".

In contrast to Principle A, Principle B states that a pronoun may not be locally bound. This implies that, within a sentence, a pronoun may refer only to a non-local c-commanding antecedent, or a non-c-commanding antecedent. By replacing the reflexive "herself" in (1) with the pronoun "her", we derive the pronoun sentence (5).

(5) Kitty says that Melody's mother touches her.

In (5), both "Kitty" and "Melody" are possible antecedents for the pronoun "her". With the additional possibility that a pronoun may refer to a sentence-external reference in the discourse, sentence (5) is ambiguous in three ways.

In this paper, we are concentrating only on the child's knowledge of the locality condition.

Previous Empirical Results

In our previous study, we tested 156 English-speaking children between the ages of 2;6 and 6;6 and 21 adults by using a version of the act-out task similar to the "Simon-Says" game (Wexler & Chien, 1985). Three sentence types were included: reflexive sentences (e.g., 6), pronoun sentences (e.g., 7) and gender control (GC) pronoun sentences (e.g., 8).

(6) {Kitty / Snoopy} says that {Sarah / Adam} should point to {herself / himself}.

(7) {Kitty / Snoopy} says that {Sarah / Adam} should point to {her / him}.

(8) {Snoopy / Kitty} says that {Sarah / Adam} should point to {him / her}.

As can be seen from (6)-(8), each test sentence involved a matrix verb "say" and a tensed complement. Sentences with "Sarah" were designed for female subjects; those with "Adam" were designed for male subjects. In our experiments, "Sarah" was replaced by the name of the girl who was tested; "Adam" was replaced by the name of the boy who was tested. In the test sentences, there were two potential antecedents for the following reflexives or pronouns. Among these two potential antecedents, only the child's name (e.g., "Sarah" or "Adam") locally c-commands the reflexive or the pronoun; the matrix subject NP (e.g., "Kitty" or "Snoopy") does not.

In the "Simon-Says" game, the experimenter held two puppets (e.g., "Snoopy" & "Kitty") and read a test sentence such as (6). The child was asked to perform an action whenever he/she heard "Kitty says" or "Snoopy says". The results are illustrated by the lines with small squares in Figures (1) to (4). On the abscissa we plot ages in six-month intervals. Group 1 consists of children between the ages of 2;6 and 3;0 (years; months). Group 8 consists of children from 6;0 to

6;6. At least 15 subjects were tested in each group. On the ordinate we plot percentage of correct items. The major findings of this study are summarized as follows:

(A) In Figure 1, the line with small squares shows that children older than 6;0 (G8) know the major property of reflexives that the antecedent must be local. Their percentage correct is 90%. This line also indicates that children's performance on the locality property of reflexives increases continuously from about the 13% level at age 2;6 to almost perfect performance at 6;0.

(B) In Figure 3, the line with squares indicates that children in the age range of 6;0 to 6;6 still do not have the knowledge that a pronoun may not have a local c-commanding antecedent. Group 8 children show only 64% correct. That is, about 36% of the time these children violate principle B. Since chance performance is 50%, the children demonstrate at best only a little knowledge of Principle B. This line also indicates that children's performance on the requirement that pronouns may not have a local c-commanding antecedent stays roughly flat from 2;6 to 6;6, with only a slight improvement. This flat curve is in direct contrast to the steady increase for the reflexive.

(C) In Figure 4, the line with the squares shows that, when there is a gender match between the pronoun and its correct non-local c-commanding antecedent, children pay attention to this gender matching cue and make correct judgments perfectly. Even the youngest children (2;6-3;0) are 80% correct. These results show that Principle B is not constraining the children. The pronouns can take either antecedent and the children use other cues to determine their choice. Gender for pronouns is very well established.

The Lexical Learning Hypothesis proposed by Wexler & Manzini (1987) [based on Borer's (1984) hypothesis that languages vary only in their lexical and morphological properties] was adopted to interpret these developmental results. According to this hypothesis, Principles A and B are unlearned; they are part of the innate endowment that the child brings to the language acquisition task. Lexical items, on the other hand, are learned. This implies that, as long as the child learns that "herself/himself" is a reflexive, and "her/him" is a pronoun, he/she should be able to link these two lexical items to the corresponding principles and to correctly identify their antecedents.

From the stand-point of the Lexical Learning Hypothesis, the developmental results for our reflexive sentences are predicted. That is, a certain period of time is expected and required for a child to complete the learning task that "herself/himself" is a reflexive. This learning, according to our results, is completed around the age of 6;0 (i.e., the age by which almost perfect performance is observed). The question remaining unsolved, however, is why the youngest children consistently choose a non-local antecedent for the

reflexive. That is, why are the Group 1 children only 13% correct, instead of about 50% correct, which is the chance expectation? Does this represent part of children's grammatical knowledge at this age, or are other pragmatic factors (e.g., saliency of the puppet in the experiment) determining the results at this age?

The developmental results for our pronoun sentences, on the contrary, are not consistent with the prediction generated by the Lexical Learning Hypothesis. Only very little improvement from the youngest to the oldest children is observed. At the age of 6;6, there are still a large number of violations of the requirement that pronouns may not have a local c-commanding antecedent. The question is then, "at what age, will this learning be completed and why is there such a time lag between the learning of reflexives as reflexives and that of pronouns as pronouns?"

The Current Experiments

There are at least three questions which we seek to study in the following two experiments:

(A) It has been claimed by Solan (1987) that children show different binding effects between sentences with infinitival complements and sentences with tensed complements. Our previous experiment used tensed complements. In order to test these differential effects on binding, in the succeeding experiment, we employed sentences containing the matrix verb "want" and an infinitival complement using exactly the same methodology, namely the "Simon-Says" game, and a different methodology (the "Party" game).

(B) We wish to replicate and to investigate in more detail the results from our previous study, especially, those involving the younger children's responses to the reflexive sentences and the older children's responses to the pronoun sentences. First, we want to find out why young children, when dealing with reflexive sentences, systematically choose the "long-distance" non-local antecedent. Second, the violation of Principle B result seems so important that we want to investigate whether the result holds up using different experimental methods and with different linguistic materials.

(C) Children's almost perfect responses to the Gender Control Pronoun sentences indicate that children do pay attention to this extra cue. In our succeeding experiments, an additional sentence type, namely the Gender Control Reflexive sentences, is included. This is designed to investigate whether gender also provides an efficient cue to reflexive sentences.

Experiment One

Experiment One was designed to test infinitival structures and

to also use the gender control for reflexives. We tested 142 children (between the ages of 2;6 and 6;6, with a mean age of 4;5) and 20 adults on the "Simon-Says" game. Four sentence types were included: reflexive sentences (e.g., 9), pronoun sentences (e.g., 10), GC reflexive sentences (e.g., 11) and GC pronoun sentences (e.g., 12). All sentences included in this experiment contained the matrix verb "want" and an infinitival complement.

(9) {Kitty / Snoopy} wants {Sarah / Adam} to point to {herself / himself}.

(10) {Kitty / Snoopy} wants {Sarah / Adam} to point to {her / him}.

(11) {Snoopy / Kitty} wants {Sarah / Adam} to point to {herself / himself}.

(12) {Snoopy / Kitty} wants {Sarah / Adam} to point to {him / her}.

In the test sentences, there were two potential antecedents for the following reflexives or pronouns. In these sentences, only the child's name (e.g., "Sarah" or "Adam") locally c-commands the reflexive or the pronoun; the matrix subject NP (e.g., "Kitty" or "Snoopy") does not. Five different actional verbs ("touch", "point to", "scratch", "pat" and "tickle") were included. There were two items for each verb, yielding a total of 10 sentences for each sentence type and a total of 40 test items for each subject.

The results of this experiment are illustrated by the lines with small crosses in Figures (1) to (4). In general, these results replicate the results indicated in our previous study. The major findings are summarized as follows:

(A) In Figure 1, the line with crosses shows that children older than 5;6 (i.e., the G7 & G8 children) know the major property of reflexives when dealing with the "want-reflexive" sentences consisting of infinitival complements. We find that the knowledge that the reflexive must have a local antecedent is revealed at a slightly earlier age with these "want-reflexive" sentences than the "say-reflexive" sentences which involve tensed complements. The line with the crosses in Figure 1 also indicates that children's performance on the "locality" property of reflexives continuously increases from about 36% at age 2;6 and approximates the adult's level around age 5;6. In many cases, the youngest children choose the non-local antecedent for the reflexive. These results replicate the results of our previous study.

(B) In Figure 3, the line with small crosses indicates that children in the same age range (5;6 to 6;6) still do not show the knowledge that a pronoun may not be c-commanded by its local antecedent. Their performance on the requirement that pronouns may not have a local c-commanding antecedent does not change too much in the age range we have studied (2;6 to 6;6). In our oldest age group, it still remains at

The Results

The 'Simon-Says' Game

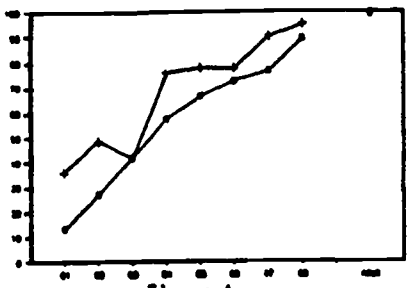


Figure 1

The 'Party' Game

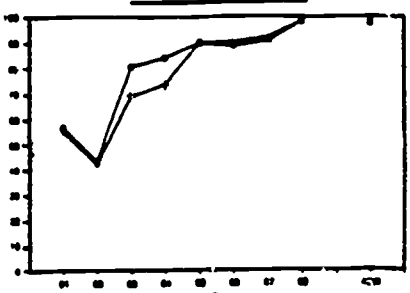


Figure 5

R: CR between R and the Local C-C Antecedent (i.e., CR-C) [Correct Responses]

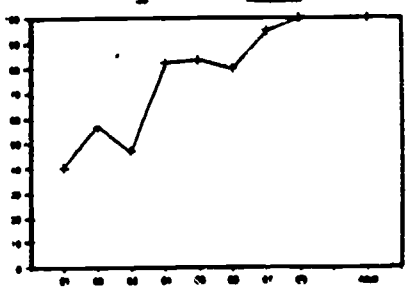


Figure 2

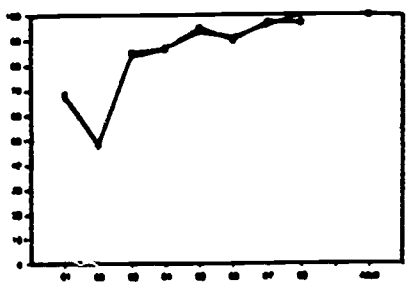


Figure 6

GCR: CR between R and the Local C-C Antecedent (i.e., CR-C) [Correct Responses]

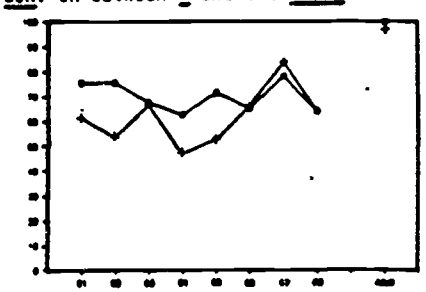


Figure 3

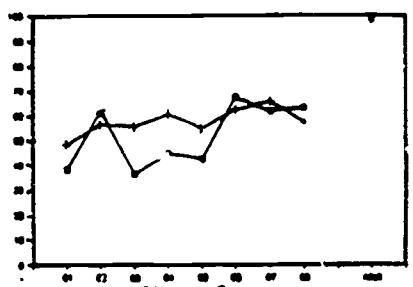


Figure 7

P: CR between P and the Non-Local C-C Antecedent (i.e., CR-PM) [Correct Responses]

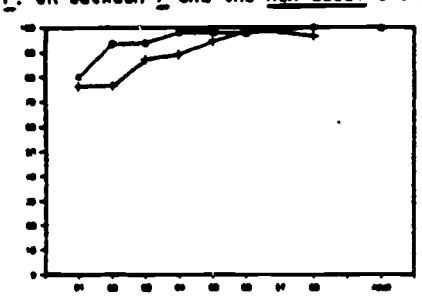


Figure 4

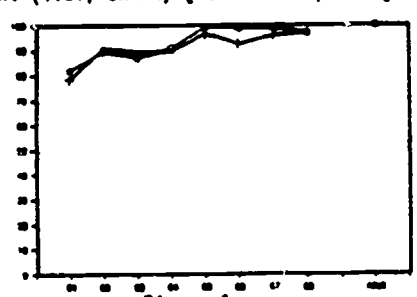


Figure 8

GCP: CR between P and the Non-local C-C Antecedent (i.e., CR-PM) [Correct Responses]

Abscissa: Age Groups [G1-G8 (6 mons. interval) and Adult]
Ordinate: % of Items

Say: ■——■		Want: +——+	
R:	Reflexive	P:	Pronoun
GCR:	Gender Control Reflexive	GCP:	Gender Control Pronoun
CR:	Coreference Judgement	C-C:	C-Commanding
CR-C:	Coreference with the Child	CR-PM:	Coreference with the Puppet Mentioned

only about 64% correct. These results again replicate our previous results.

(C) Comparing the line in Figure 2 with the line with small crosses in Figure 1, we find that gender match between the reflexive and its local c-commanding antecedent does not help children too much in making correct coreference judgments. Gender match between the pronoun and its non-local antecedent, however, has a strong effect on the pronoun responses, as Figure 4 shows. The result regarding children's responses to the GC pronoun sentences also replicates the result of our previous study.

Experiment Two

Our second experiment was designed to test whether the youngest children believed as a matter of linguistic knowledge that reflexives and pronouns need non-local antecedents. We reasoned that, if we could manipulate the children's responses by pragmatic cues, their behavior in our earlier experiments was most likely a response bias, rather than a demonstration of linguistic knowledge. For example, perhaps the two-and-a-half-year olds would rather point at a puppet than themselves in our task. Therefore we created the "Party" game, a situation in which we expected the response bias to be eliminated or decreased by making the local response (an act of giving to oneself) more attractive to the child.

We tested 174 children (in the same age range as in Experiment One) and 20 adults in the "Party Game". The experimenter set up a situation in which a female and a male puppet were sitting in front of the child. A big plate containing different small toys or props was put in the middle of a table between the child and the puppets. In front of the child and each puppet, there was an empty bowl for them to keep toys. The child was expected to take a small toy from the center plate and put it into either his/her own bowl or one of the puppet's bowls, according to the sentence presented to him/her. Four sentence types were included: reflexive sentences (e.g., 13), pronoun sentences (e.g., 14), GC reflexive sentences (e.g., 15) and GC pronoun sentences (e.g., 16). Half of the test sentences in each type involved the matrix verb "say" which subcategorizes for a tensed complement; the other half involved the matrix verb "want" which subcategorizes for an infinitival complement. There were 4 items per condition [2 for each of two dative constructions used (e.g., X gives Y a Z or X gives a Z to Y)], yielding a total of 32 sentences for each subject.

(13) {Kitty / Snoopy} says that {Sarah / Adam} should give {herself / himself} a car.

(14) {Kitty / Snoopy} says that {Sarah / Adam} should give {her / him} a popsicle.

(15) {Snoopy / Kitty} says that {Sarah / Adam} should give {herself / himself} a cup.

(16) {Snoopy / Kitty} says that {Sarah / Adam} should give {him / her} a whistle.

The results regarding the say-sentences are illustrated by the lines with small squares in Figures 5 to 8; those regarding the want-sentences are illustrated by the lines with small crosses in the same figures. The major findings are summarized as follows:

(A) Concerning the reflexive sentences, a very strong within-task (i.e., the "Party" game) & between-complement-type consistency (want-infinitive vs. say-tensed) was found in this experiment. As indicated by the two lines in Figure 5, children older than 4;6 (i.e., G5 to G8 children) behave as if they know that the antecedent of the reflexive must be local. Only a slightly higher performance was found in G3 and G4 (3;6-4;6) for the say-reflexive than the want-reflexive sentences. For all the other groups, the response patterns to these two sentence types are almost the same. These two lines also show that children's performance on the locality property of reflexives increases continuously from the chance level (50%) at age 2;6 to almost perfect performance at 6;6. Compared to our previous two studies, in general, children showed higher percentage of correct responses to the reflexive sentences when the "Party" game (say: 80.25%; want: 76.75%) rather than the "Simon-Says" game (say: 57.30%; want: 57.30%) was applied. Comparing Figure 5 with Figure 1, the knowledge that the reflexive must be c-commanded by its local antecedent attained the 90% level in the age range of 4;6-5;0 (for the "Party" game) and in the age range of 5;6-6;6 (for the "Simon-Says" game). It is important to note that, when the "Party" game rather than the "Simon-Says" game was introduced, the very young children's systematic tendency to coindex the reflexive with the non-local referent disappeared. The choice of local or non-local antecedents becomes more random and close to the chance level. [For Group 1, in the "Simon-Says" game (Figure 1) the local antecedent was selected 13% and 35% for the two kinds of sentences, and in the "Party" game (Figure 5), the local antecedent was selected about 55% for both kinds of sentences.]

(B) As indicated by the two lines in Figure 7, children at 6;6 still do not show knowledge of Principle B, namely that a pronoun may not have a local c-commanding antecedent. This result is consistently found in both the say- and the want-pronoun constructions. A higher performance was found in G3 to G5 (3;6-5;0) for the want-pronoun than the say-pronoun sentences. For the other groups, the response patterns are similar for the two types of constructions. Their performance on the requirement that pronouns not have a local c-commanding antecedent again stays relatively flat from 2;6 to 6;6. For both types of constructions, it still

remains at only about 60% correct in the oldest age group. Concerning the pronoun sentences, an important and consistent finding should be noted; that is, children's Principle B violations adopt a very similar pattern in all three experiments, regardless of the between-task and between-complement-type differences. When the extra gender cue is not available, this type of anaphora mistake does not decrease as a function of age. In addition, the youngest children produced more non-local responses for the "Simon-Says" game than for the "Party" game. [For Group 1, in the "Simon-Says" game (Figure 3) the non-local antecedent was selected 75% and 61% for the two kinds of sentences, and in the "Party" game (Figure 7), the non-local antecedent was selected 38% and 48% for the two kinds of sentences.]

(C) The two lines in Figure 6, compared to the lines in Figure 5, indicate that the gender cue does not help children's coreference judgments too much when reflexive sentences are considered. The two lines in Figure 8 (compared to the lines in Figure 7), on the other hand, indicate that, with the presence of the controlled gender cue, children make correct judgments almost perfectly when the GC pronoun sentences are considered. Again, children's responses to the GC sentences replicate the results found in our previous studies.

Conclusion

To conclude, when the relative patterns rather than the absolute scores or ages are considered, the results of our current two experiments replicate most of the results found in our previous study. That is, when the target task is to make coreference judgments between the reflexive or the pronoun and the two sentence-internal antecedents, children do differentiate reflexive sentences from pronoun sentences in all experiments. They do this regardless of the different complement types in the test sentences (i.e., tensed complement or infinitival complement) and the different tasks applied in the experiments (i.e., the "Simon-Says" game or the "Party" game). Children at the youngest ages (2;6-3;6) often respond according to a response bias, and not according to a locality condition. This is true for both reflexives and pronouns. By age 6 or earlier, they have learned the locality condition for reflexives, whether the complements are tensed or infinitival. Children at this age, however, have still not learned the non-locality condition for pronouns. A developmental delay of Principle B compared to the acquisition of Principle A is consistently revealed. The Lexical Learning Hypothesis, which is confirmed by the data relative to Principle A and apparently disconfirmed by the data relative to Principle B, needs additional investigation.

There are at least three possible ways out of this dilemma.

The first one is simply to challenge the Lexical Learning Hypothesis. Instead of stating that only lexical properties are learned, one may argue that principles are also learned, and Principle B is harder to learn than Principle A. It seems extremely unlikely that this suggestion could be correct, because correct coindexing between the reflexives or pronouns and their antecedents requires the child to have the ability to converge on knowledge that is not clearly provided by the input data. To hold the argument that principles are learned, one would have to specify what actually constitutes the positive evidence for the child to derive abstract structural notions such as "bound" and "c-command". In addition, one would still need to explain how these principles are learned and why Principle B is more difficult to learn than Principle A. In particular, notice that if a child does not have Principle A or B, there is no positive evidence to show him/her that he/she is wrong.

The second alternative suggests a reformulation of Principle B, and claims that children may have this (reformulated) Principle B (Wexler & Chien, 1985). The reformulation states that only pronouns as bound variables are subject to Principle B, and non-variable cases of Principle B are to be handled in different ways. Examples related to this refomulated principle are given in (17) and (18).

(17) Every bear says that John should point to him.

(18) Snoopy says that Goofy gave {a. himself / b. him} a candy and John should too.

In one reading, "him" in (17) is a bound variable (if "him" is coindexed with "every bear"). Sentence (18) involves VP-deletion. In (18a), if John should give himself (John) a candy, then the deleted VP contains a bound variable (the "sloppy" reading). If we violate Principle B by coindexing "him" with "Goofy" in (18b), then the reformulated Principle B will not allow a "sloppy" (bound variable) reading in the deleted VP (Reinhart, 1983). This "Principle B reformulation" approach is by no means an ad hoc one, because theoretical justification is independently formulated. For a detailed discussion of the theoretical issues regarding this reformulated Principle B, see Reinhart (1983) and Montalbetti & Wexler (1985). In addition, children's acquisition of the original vs. reformulated Principle B is empirically testable. For example, if children incorrectly coindex "her" with "Sarah" in sentences like (19), but rarely coindex "her" with "every bear" in sentences like (20), then we may argue that children have the reformulated Principle B but not the original one.

(19) Kitty says that Sarah should point to her.

(20) Kitty says that every bear should point to her.
(Suppose the bears are all females.)

To empirically support this argument, we may also test children on sentences with VP-deletion such as (18) (see Wexler & Chien, in preparation).

The third alternative has to do with the theory of Syntactic Maturation proposed by Borer & Wexler (1987) [see also Gleitman (1981)]. Instead of assuming that the formal principles available to

children are constant through development, this theory argues that certain principles mature. Like any other instance of biological maturation and the proposed syntactic maturation of "argument chain" (Borer & Wexler, 1987), we may suggest that certain Binding Principles also mature. The maturational theory indicates a possible way for interpreting the developmental delay of Principle B relative to Principle A. Following the maturational theory and looking more closely at the three binding principles proposed by Chomsky, a working hypothesis may be generated as follows. The three binding principles (A, B & C) all involve the notion of linking (or non-linking) between two elements (X & Y) in a sentence. For example, X can be a reflexive, pronoun or R-expression (i.e., name), and Y can be a potential antecedent. A principle involving disjointness between X and Y may mature later than one involving coreference. This will thus predict that Principles B and C will mature later than Principle A. Evidence for this prediction may be found in C. Chomsky (1969). Theoretical and empirical evidence concerning the growth of argument chain (c.f., Borer & Wexler, 1987) independently motivates the maturation approach. Further investigations will be necessary to see which if either of the two possible explanations (reformulation or maturation) is correct for our Binding Theory results, or indeed, whether a theory which integrates both of these explanations is even more correct.

References

Borer, H. (1984). Parametric Syntax. Foris Publications: Dordrecht.

Borer, H. & Wexler, K. (1987). The maturation of syntax. In T. Roeper & E. Williams (Eds.) Parameters and linguistic theory. Dordrecht: D. Reidel Publishing Company.

Chomsky, C. (1969). The acquisition of syntax in children from 5 to 10. Cambridge: MIT Press.

Chomsky, N. (1981). Lectures on government and binding. Dordrecht: Foris.

Gleitman, L. (1981). Maturational determinants of language growth, Cognition, 10, 103-114.

Montalbetti, M. & Wexler, K. (1985). Binding is linking, WCCFL: IV.

Reinhart, T. (1983). Anaphora and semantic interpretation. Chicago: University of Chicago Press.

Solan, L. (1987). Parameter setting and the development of pronouns and reflexives. In T. Roeper & E. Williams (Eds.) Parameters and linguistic theory. Dordrecht: D. Reidel Publishing Company.

Wexler, K. & Chien, Y.-C. (1985). The development of lexical anaphors and pronouns. Papers and reports on child language development, No. 24, 138-149. Standard University: Stanford University Press.

Wexler, K. & Manzini, R. (1987). Parameters and learnability in binding theory. In T. Roeper & E. Williams (Eds.) Parameters and linguistic theory. Dordrecht: D. Reidel Publishing Company.

PRCLD 26
1987

Fast Mapping of Novel Words in Oral Story Context

Elizabeth R. Crais
University of North Carolina - Chapel Hill

Children are thought to acquire most new vocabulary in naturalistic contexts. A child's first few encounters with a new word may dictate the amount and kind of learning that take place as a result of these early exposures and may have some impact on what ultimately is learned about the new word.

Fast mapping is the term coined by Carey and Bartlett (1978) to refer to children's initial rapid acquisition of information from limited exposures to a new word. The methodologies used to study these initial fast mappings have primarily focused on the acquisition of a single novel word with one or two encounters in a naturalistic conversational setting (Carey & Bartlett, 1978; Dickinson, 1984; Dollaghan, 1985) or the presentation of a number of new words in a training session paradigm (Holdgrafer & Sorenson, 1984; Nelson & Bonvillian, 1974; Schwartz & Leonard, 1984). The conclusions from these studies are: (a) even one encounter with a new word is sufficient for very young children (two years old) to map some information about the word in memory; (b) the more exposures to a word, generally the more complete is the map of that word; (c) comprehension and phonetic production of the word are achieved separately: (d) factors influencing this acquisition may be the number of novel words presented at any one time, and the number and type of referents available for each word; and (e) the type of presentation context, for example, definition, conversation or written story contexts, differentially affects the acquisition process across developmental ranges.

One naturalistic context that has generally been overlooked in the acquisition literature, however, is that of the presentation of novel words in an oral story context. Stories have traditionally been recognized as a means through which children learn new words and typically stories provide both a schematic framework for children and an intrinsic motivation to attend and comprehend. Dickinson (1984) used an oral story context as one of three presentation contexts in which to introduce new words, however, only one novel word was presented in each context and the novel words used were not counterbalanced across contexts.

Dickinson reported overall age differences between his first and sixth grade subjects in their metalinguistic abilities to make syntactic judgements, to recognize wordness, and to provide definitions about the novel words. Dickinson did not, however, test for exact propositional information related to the words nor for memory of the phonetic shape of the word itself, aspects likely to be established during the fast mapping phase. Thus, little information is currently available from oral story contexts on the

way in which listeners acquire the phonological representation of a new word and derive its meaning.

Two factors that might influence the fast mapping of a word, particularly during the oral presentation of a story, can be inferred from the reading comprehension, memory, and word recognition literatures. These factors are, first, proximity, which is the closeness of the recurrences of a novel word and, second, specificity, the specificness of the propositional cues associated with the word. Proximity of recurrence, or how close the repetitions of a novel word and its accompanying propositions are to one another, may be critical to a subject when gathering together information about a new word. Even with fairly familiar words and contexts, children have repeatedly been shown to fail to integrate information across propositional contexts in both oral and written material, especially when intervening content is presented (Liben & Posnansky, 1977; Markman, 1979; Moeser, 1976; Werner & Kaplan, 1952).

The second factor, the specificity of the propositional cues, refers to the type of information provided about a new word and to how easily this information leads the reader to choose a specific referent for a particular word. The speedy choice of a referent can often aid a reader in comprehending the written message. Sanford and Garrod (1981) argue that decreased specificity serves to reduce the probability that an appropriate scenario, or referent, for a particular word or sentence will be activated. Thus, both the proximity of the novel word to its recurrences and the specificity of the propositional information may be expected to affect the processing of novel words in an oral story context where the listener cannot, as easily as the reader, return to prior propositions to derive a specific meaning.

This study examined the effects that proximity of the novel words and specificity of the propositional cues might have on the fast mapping skills of subjects in an oral story context. In order to control for any bias that might accompany real words, nonsense, and therefore novel, words were selected as the vocabulary to be introduced in the stories. The novel words referred to meanings already available to the child, but in some cases were specific references and in others implied a range of possibilities.

The subjects in this study were 20 first, third, and fifth grade children and adults living in a small metropolitan city. Each subject listened to four stories which each included four nonsense words. Each nonsense, or novel, word was repeated three times within a story. The 16 novel words represented common nouns and the meanings could be derived from the propositional information associated with each occurrence of the novel words. The novel words and their phonetic transcription can be seen in Appendix A.

The two factors of particular interest in this study were the proximity of the novel word recurrences and the specificity of the propositional information surrounding the novel words. The recurrences of the novel word and its associated propositional cues

were either close in proximity, separated by only one sentence, or were more distant in the story, separated by at least three sentences and a topic change. The propositional cues which accompanied the novel words also varied in their degree of specificness. For eight of the words, the cues were very specific and therefore narrowly restricted the choice of a common referent to one or two probable choices. For the other eight words, the propositional cues were nonspecific and much broader and therefore allowed several (or more) referent choices. The two factors and their two levels can be seen in a sample story in Appendix B. The sixteen novel words were counterbalanced across the stories and across the four experimental conditions.

The four stories were presented from audiotapes recorded by a female radio announcer skilled in reading children's stories. Following story presentation, the subjects were required to retell the stories, to listen to sentences from the stories and to fill-in-the-blanks when story-related novel and familiar words were left out, and to tell what they could remember about the novel words and selected familiar words from the stories.

Analyses of variance with group, specificity, and proximity as factors were performed on three dependent measures (phonological production of the novel words during story retelling, cued production of the words with sentence context provided, and comprehension of word meaning by propositional recall). Means and standard deviations for each dependent measure can be seen in Tables 1-5. Overall group differences ($p<.05$) were seen, except between the third and fifth grade groups, on all three dependent measures. With increasing age, the groups were more likely to produce correctly the phonological form of the novel words in both the story retells and on the cued production task, and were better able to recall propositions associated with the novel words.

Producing the phonological form of the novel words and associating those forms with the correct propositions proved to be difficult tasks for all the children, particularly the first graders. It was apparent from the errors in phonological production made during the story retells, that the children could often represent the content of the novel words in the retells, but had much more difficulty than the adults in either producing or attempting to produce the phonological form of the words. Additionally, from the comprehension of word meaning task, it was clear that all the children could report more propositions than they were able to associate correctly with the novel words. Thus, both the correct storage of the phonological form of the novel words and the linking of that form with the correct propositions were crucial elements for all the subjects, but were especially fragile in the children's processing of the words.

In addition, the results of the comprehension of word meaning task and the phonological production task revealed that specificity and proximity had differential effects on novel word acquisition dependent on the type of information to be acquired and recalled. On the comprehension of word meaning task all the subjects recalled

more propositional information when the novel word reoccurrences were close together. This effect was only evident, however, on the nonspecific items. The novel words which had more specific propositional information showed very little difference in the number of propositions recalled for the close versus distant conditions. All the subjects had more difficulty recalling propositions which were nonspecific and distant.

The phonological production results, in contrast, were opposite to the comprehension results. It was the novel words with less specific propositional cues and the ones whose repetitions were further apart which were the best recalled by all the subjects. Although the effects were small (only one half word recalled better in the nonspecific condition), the difference between the distant and close items was a large one (almost two words better recalled in the distant condition). When the novel word reoccurrences were close to one another and had specific propositional information surrounding them, it was more difficult for the subjects to acquire the phonological forms of the words and therefore recall them.

An explanation for these findings, particularly for their opposing effects, may be found by considering what the listener is doing when hearing and attempting to understand a story with novel words. It could be hypothesized that, when receiving very specific and very close information about a novel word, the listener is better able to use that information to choose a real world referent for the novel word, and is therefore less dependent on the phonological form of the word. In this case, although the phonological form of the word itself may not be retained, the listener is readily able to use the chosen referent for attaching and integrating the associated propositions, thus facilitating the later recall of those propositions. And the reverse occurs when the listener is given less specific or more distant information. In this case, it is not as easy for the listener to integrate the propositions and choose a referent, and therefore, the phonological form of the word becomes more important in the attempt to connect the later propositions. And conversely, the associated story propositions are less well recalled because a ready referent is not available to which to attach the propositions.

The results indicated that when the listener was provided with nonspecific propositional information, the close proximity of the reoccurrences of the novel word facilitated recall of that information. The specific items did not display this same trend and therefore it may be that when specific propositional information is provided, a referent is more easily chosen (and the associated propositions more quickly attached), and therefore the distance between the reoccurrences becomes less important.

The results from both the phonological production and comprehension of word meaning tasks support the idea that the listener processes various aspects of the novel word and its meaning differently dependent on the propositional context available. The phonological form of the words was better recalled

when the propositional information associated with the words was less specific and more distant. The propositional information, on the other hand, was better retained when the information was close together and the referent was very specific.

From the reading comprehension literature come two opposing points of view of what happens when an unfamiliar word is encountered in reading. One model, based on Rumelhart (1977), would argue that on encountering a new word, the reader begins to develop hypotheses about the novel input string. The hypotheses are sent to a message center and confirmed, disconfirmed, or replaced by new hypotheses. The reader is said to be spending cognitive effort to derive the meanings of unfamiliar words. A second possibility, the minimum effort principle, has been suggested by Freebody and Anderson (1983). Freebody and Anderson contend that rather than spend immediate effort on the word, the reader often skips over the unfamiliar word and continues reading. Then, at the point of later testing, the reader either reconstructs information from partial memory of the passage combined with world knowledge, or tests probabalistic assertions to come up with an answer. Thus, as Freebody and Anderson suggest, the reader commits as little effort as possible during proposition by proposition encoding of the text.

Although the novel words in this study were presented in an oral context, the results nonetheless support the cognitive effort view of processing. The effects that specificity and proximity had on both the phonological production and the comprehension of word meaning would appear to support the idea that the listener is actively attempting to integrate information about the novel words while listening to the propositions. The disruption in integration that occurred when listening to nonspecific and/or distant propositions was represented across all subjects.

In conclusion, the fast mapping of novel words in story context has proven to be a flexible and useful paradigm for looking at fast mapping skills across a wide developmental range. The use of stories provided a natural context for word acquisition, motivated the subjects to attend to the task, and permitted the systematic manipulation of variables affecting the fast mapping process. This paradigm has excellent potential for future study with both children and adults and could be manipulated to include variation of story type and length, mode of presentation, or story structure.

References

Carey, S. & Bartlett, E. (1978). Acquiring a single new word. Papers and Reports in Child Language Development, 15, 17-29.

Dickenson, D. (1984). First impressions: Children's knowledge of words gained from a single exposure. Applied Psycholinguistics, 5, 359-373.

Dollaghan, C. (1985). Child meets word: Fast mapping in preschool children. Journal of Speech and Hearing Research, 28, 449-454.

Freebody, P. & Anderson, R. C. (1983). Effects on text comprehension of differing proportions and locations of difficult vocabulary. Journal of Reading Behavior, 15, 19-39.

Holdgrafer, G. & Sorenson, P. (1984). Informativeness and lexical learning. Psychological Reports, 54, 75-80.

Liben, L. & Posnansky, C. (1977). Inferences on inferences: The effects of age, transitive ability, memory load, and lexical factors. Child Development, 48, 1490-1497.

Markman, E. (1979). Realizing that you don't understand: Elementary school children's awareness of inconsistencies. Child Development, 50, 643-655.

Moeser, S. (1976). Inferential reasoning in episodic memory. Journal of Verbal Learning and Verbal Behavior, 15, 193-212.

Nelson, K. & Bonvillian, J. (1973). Concepts and words in the eighteen month old: Acquiring concept names under controlled conditions. Cognition, 2, 435-450.

Rumelhart, D. (1977). Toward an integrative model of reading. In: S. Dornic (Ed.), Attention and Performance VI. Hillsdale, NJ: Erlbaum.

Schwartz, R. & Leonard, L. (1984). Words, objects, and actions in early lexical acquisition. Journal of Speech and Hearing Research, 27, 119-127.

Werner, H. & Kaplan, E. (1952). The acquisition of word meanings: A developmental study. Monographs of the Society for Research in Child Development, 15 (1, Serial No. 51).

TABLES

Table 1. Phonological Production: Mean number (and standard deviations) of correct phonological productions (maximum possible = 16).

Group	First	Third	Fifth	Adult
X =	1.45	3.36	4.15	10.35
SD =	(0.94)	(2.18)	(2.48)	(3.15)

Table 2. Phonological Production: Mean correct for specific, nonspecific, distant, and close conditions (maximum possible = 8).

Nonspecific = 2.59	Specific = 2.24
Distant = 2.84	Close = 1.99

Table 3. Cued Production: Means (and standard deviations) of the number correct novel words (maximum possible = 16).

Group	First	Third	Fifth	Adult
X =	1.35	4.55	4.55	10.95
SD =	(1.14)	(3.14)	(2.89)	(2.82)

Table 4. Comprehension of Word Meaning: Mean number (and standard deviations) of correct propositions (maximum possible = 24).

Group	First	Third	Fifth	Adult
X =	2.88	7.01	7.20	13.40
SD =	(2.68)	(3.30)	(3.22)	(2.13)

Table 5. Comprehension of Word Meaning: Mean number (and standard deviations) of correct propositions by story context condition (maximum possible = 24).

	Specific Distant	Specific Close	Nonspecific Distant	Nonspecific Close
X =	8.15	7.80	5.89	8.65
SD =	(5.36)	(4.57)	(3.92)	(5.13)

APPENDIX A

Novel Words with their IPA transcription

Poom	/pum/	Tash	/tæʃ/	Nen	/nɛn/	Nif	/nɪf/
Sais	/ses/	Doyd	/dɔɪd/	Wup	/wʌp/	Gug	/gʌg/
Keke	/kiki/	Momo	/momo/	Soosoo	/susu/	Wayway	/wewe/
Hobuh	/hobə/	Gobi	/gabi/	Yeduh	/jidə/	Fepo	/fipo/

APPENDIX B

Sample story containing four novel words (capitalized) in each combination of experimental conditions: specific-distant (SD), specific-close (SC), nonspecific-distant (NSD), nonspecific-close (NSC).

Once there was a MOMO (SC) who lived in a castle. The castle was by a beautiful lake. The MOMO (SC) had a son, named John, and two ducks. One duck was a girl and one was a boy duck, but no one knew which was which. The MOMO (SC) was sitting on the throne and he told John to find out which duck was the girl duck. John was excited and was ready to start. He knew if he could find out which one was the girl duck, he would get the TASH (NSD) he'd always wanted. John ran around the castle and asked everyone about the ducks. But no one seemed to be able to help him. John decided this was kind of like a DOYD (SD) and he'd always liked playing with them. He was sure he'd find out about the ducks if he just asked the right person.

John then left the castle and went to see a GOBI (NSC) at his house. He said "Please help me find out which is the girl duck". The GOBI (NSC) had animals and knew all about animals. When John saw all the animals, he was sure he'd come to the right place. The wise GOBI (NSC) said "Take the ducks to some water and see which one gets in first. The one who gets in first is always the girl duck". John was very pleased and all he could think about was playing with his TASH (NSD) when he got home. But first he had to get the ducks and take them to some water. Only then would this funny DOYD (SD) have all its parts.

John took the ducks to the lake by the castle. He put a red string around the neck of the duck who got in the water first. He ran back inside the castle and showed everyone the duck with the string. He said "Look everyone this is the girl duck. I have finally put the last piece in the DOYD (SD) and it is finished". All the people clapped and cheered and were very proud of John. And just as John thought, there was a beautiful TASH (NSD) waiting for him. John was happy and told everyone how he'd found out about the ducks.

PRCLD 26
1987

Telegraphic Speaking Does Not Imply Telegraphic Listening

LouAnn Gerken
City University of New York, The Graduate Center

The rules of syntax are generally defined in terms of phrasal categories, such as noun-phrase and verb-phrase. Thus, an important task for a child acquiring these rules is to identify phrases in the sentences which he or she hears. How might a child accomplish this task?

One phrase segmentation cue which has been postulated is sentence intonation (e.g., Morgan, 1986). It has been argued that parents produce exaggerated intonation in their speech to young children, and that such exaggerated cues might allow children to determine where major phrases begin and end. Although intonation may allow children to segment one phrase from another, it does not provide information as to a phrase's type. That is, parents don't produce consistently different intonation patterns for noun-phrases than for verb-phrases. Therefore, other cues are necessary to allow children to identify phrases in the sentences they hear.

The cue to phrase identification which I will discuss here is function morphemes, such as articles and verb inflections. Functors have at least three properties which make them potentially useful to a child whose task is to locate phrasal units. First, functors are extremely frequent. For example, the articles 'the' and 'a' combined account for 9% of all tokens. Second, functors in most languages occur in characteristic locations within phrases. In English, they tend to occur at the beginnings and ends. A third property of functors is that they usually have characteristic phonological properties which cause them to interact with sentence intonation. For example, function morphemes in English usually are unstressed and tend to be produced with reduced vowels, thus contributing to English's stress-timed melody.

These three functor properties, frequency, phrase-location, and phonology, might allow a child to segment and identify phrases in a sentence, even when the content words are unknown. For example, in the sentence, 'The zigs riffed the nug' a child could use function morphemes to infer that 'the zigs', 'riffed', and 'the nug' are linguistically relevant units. Furthermore, he or she could lablel 'zig' and 'nug' as nouns, because the both are preceded by 'the', and 'rif' a verb, because it is followed by 'ed'. The child might combine this functor-aided partial analysis with other linguistic and pragmatic information to arrive at a fuller representation of the sentence.

The problem with the view that young children use functors to identify phases is that they often do not consistently produce functors in their own speech. This has lead many researchers to hypothesize that children are not sensitive to functors in the

speech they hear. Contrary to this hypothesis, I will present data which suggest that children are in fact sensitive to functors in speech perception. In light of these data, I will postulate an alternative explanation for children's functor omissions.

Two specific hypotheses stating that children are not sensitive to functors have been proposed. One of these I will call the content attention hypothesis. It states that children selectively listen for familiar content words, and thereby ignor the surrounding functors in the sentences they hear. This view is consistent with a host of theories in which the child's initial approach to syntax is based on categories of concretely referential words (e.g., Grimshaw, 1981; Pinker, 1984).

Another position on which children are not sensitive to functors is the stress hypothesis. It states that children selectively attend to stressed words and syllables and ignore unstressed elements. Since functors in English and other languages are typically unstressed, children ignore them (e.g., Gleitman & Wanner, 1982).

The alternative to these two hypotheses which I will argue for, is that children are sensitive to functors and only omit them due to factors specific to speech production. In particular, I will argue that children omit functors only after they have analyzed these elements as separate morphemes. On this view, children may have some production limitation which specifically limits the number of morphemes (as opposed to the number of syllables) which they can produce. This is consistent with observations that many children include functors as unanalyzed syllables in their early speech, then omit them, and finally use functors productively sometime in their second year (Bates, Bretherton, & Snyder, in press; Peters, 1983).

In order to test the content attention and stress hypotheses, children were asked to imitate strings which varied on two dimensions (see Table 1). The content words were either English or nonsense, and likewise, the functors were either English or nonsense. The measure of children's imitations examined was the frequency of functor omissions.

The content attention hypothesis predicts that when children hear strings with English content words, they will selectively listen to these words, and ignore surrounding functors, regardless of whether these functors are English or nonsense. In reading the strings, the experimenter attempted to give the content words (both English and nonsense) more stress than the functors (both English and nonsense). Therefore, the stress hypothesis also predicts that children will attend to the content (stressed) words and ignore the functors (unstressed syllables), regardless of whether functors are English or nonsense.

The subjects for this study were 16 children with a mean age of 2;2. The experimenter visited them in their homes and played with them for about one half hour before beginning the imitation task. Each child's MLU was calculated from the spontaneous speech

Table 1

Sample strings for Experiment 1

	string	content word	functor
1a	Pete pushes the dog	English	English
1b	Pete pusho na dog	English	nonsense
1c	Pete bazes the dep	nonsense	English
1d	Pete bazo na dep	nonsense	English

Table 2

Percent functors omitted by low MLU children in Experiment 1

	content word	
	English	nonsense
functor		
English	41%	33%
nonsense	33%	20%

that he or she produced during this initial warm-up period. The mean MLU was 2.82 morphemes. In order for an imitation to count as a functor omission, both content words must have been produced correctly. And, imitations in which functors were replaced by filler syllables were not counted as functor omissions.

Children were divided into 2 groups based on their MLU's. The higher MLU group made very few omissions at all, and therefore the data presented here are for the low MLU group alone. Their average MLU was 1.73 morphemes. An analysis of variance showed that these children omitted significantly more English functors than nonsense functors ($F(1,7)=8.27$; $p=.02$; see Table 2). This result did not interact significantly with whether content words were English or nonsense ($p=.75$).

Children's ability to distinguish between English and nonsense functors suggests that they are not ignoring these elements, and contradicts both the content attention and stress hypotheses. Furthermore, the fact that they omitted English functors more frequently than nonsense functors supports the view that they omit functors because they have analyzed them as separate morphemes. However, these data are not entirely conclusive. It is possible that English functors were presented to children with weaker stress than nonsense functors, causing children to omit the former more frequently than the latter. The stress hypothesis must be more completely ruled out before we can conclude that children are, in fact, sensitive to functors.

In the second experiment, the strings were generated on a DECtalk speech synthesizer so that all string types would have the same intonation contour. Briefly, DECtalk first assigns each string a phonetic representation. It then imposes an intonation template on the this representation, by giving the string a fundamental frequency contour, augmenting the stress on the content words, and decreasing the stress on the functors. Because the same template was applied to all strings, we can be certain that nonsense functors received the same weak stress as English functors.

Fifteen subjects with a mean age of 2;2 participated in the study. The experiment followed the same procedure used in the previous one. Children were again divided into high and low MLU groups based on their spontaneous speech. As before, high MLU children omitted very few functors from their string imitations, and the data presented are for only the low MLU group. Their mean MLU was 2.07 morphemes.

As Table 3 shows, children continued to omit English functors more frequently than nonsense functors, even when intonation was stringently controlled ($F(1,6)=15.24$; $p=.007$). There was a significant interaction with content word, so that the omission difference between English and nonsense functors was larger for strings with English content words ($F(1,6)=9.31$; $p=.02$). However, the effect was also significant for strings with nonsense content words.

Table 3

Percent functors omitted by low MLU children in Experiment 2

	content word	
	English	nonsense
functor		
English	52%	26%
nonsense	18%	13%

These data allow us to confidently rule out the stress explanation for children's omissions. However, one other explanation for children's omissions is possible. Note that the English functors both contain the reduced vowel schwa, whereas the vowels in the nonsense functors are unreduced. Perhaps it isn't stress, per se, which causes children to omit functors, but rather the reduced vowel correlate of weak stress.

In the final experiment, this possibility was tested by having children imitate strings in which both English and nonsense functors contained schwa (see Table 4). Half of the children heard tape recorded human speech and half heard DECtalk. There were 16 children with a mean age of 2;3. The procedure used was the same as the other two studies. As in those studies, children were divided into high and low MLU groups, based on their spontaneous speech. Children in the high MLU group omitted very few functors, and therefore only the low MLU children will be discussed. They had a mean MLU of 2.21 morphemes. Because the form of stimuli children heard (either voice or DECtalk) did not interact with the number of functor omissions, these data are collapsed across the two stimulus groups.

As in the previous experiments, children omitted significantly more English functors than nonsense functors ($F(1,7)=5.50$; $p=.05$; see Table 5). This effect did not interact with whether content words were English or nonsense ($p=.62$). Hence, children appear to distinguish familiar functors from phonologically very similar syllables. Therefore, we have good evidence that children are indeed sensitive to function morphemes. In addition, the hypothesis that children omit functors because they have analyzed them as separate morphemes is consistent with the data obtained from all three studies.

I would like to draw two conclusions from these studies. First, I believe that we should accord more importance to distributional cues, such as functors, in our language acquisition theories. In many current theories, functors are only given a role after much of the child's linguistic knowledge is already in place. I think that these data suggest that function morphemes may be important earlier in the language learning process.

The second conclusion I would like to suggest is that we need a better understanding of young children's speech production processes. Language acquistion researchers have traditionally accepted the notion that children's production probably doesn't mirror their mental representation of language. The data presented here are certainly consistent with this position.

However, it is usually assumed that there is simply a temporal lag between a when a child 'discovers' some bit of linguistic information, and when that information is reflected in his or her speech. Contrary to this view, the production-based explanation of functor omissions which I have offered, suggests that speech production processes may distort a child's linguistic knowledge in very specific ways. It is only through understanding these

Table 4

Sample strings for Experiment 3

	string	content word	functor
4a	Pete pushes the dog	English	English
4b	Pete pusheg le dog	English	nonsense
4e	Pete bazes the dep	nonsense	English
4f	Pete bazeg le dep	nonsense	nonsense

Table 5

Percent functors omitted by high MLU children in Experiment 3

	English	nonsense
functor		
English	50%	25%
nonsense	29%	19%

processes that we will be able to determine what the child's underlying linguistic representation is.

References

Bates, E., Bretherton, I., & Snyder, L. From first words to grammar: individual differences and dissociable mechanisms. New York: Cambridge University Press, in press.

Gleitman, L. & Wanner, E. The state of the state of the art. In E. Wanner & L. Gleitman (eds.), Language acquisition: the state of the art. Cambridge, England: Cambridge University Press, 1982.

Grimshaw, J. Form, function, and the language acquisition device. In C.L. Baker & J.J. McCarthy (eds.), The logical problem of language acquisition. Cambridge, MA: MIT Press, 1981.

Morgan, J.L. From simple input to complex grammar. Cambridge, MA: MIT Press, 1986.

Pinker, S. Language learnability and language development. Cambridge, MA: Harvard University Press, 1984.

PRCLD 26
1987

THE ACQUISITION OF WORD STRESS RULES IN SPANISH

Judith G. Hochberg
University of Chicago

Introduction

This paper tests the hypothesis that children learning Spanish as a first language learn rules for assigning stress, as opposed to simply memorizing stress on a word-by-word basis.[1] The general question of stress rule learning is of tri-fold interest to the psycholinguist (and, hopefully, to linguists in general). First, relatively little is known about the learning of phonological rules (as opposed to morphological and syntactic rules), since developmental phonology has focused more on children's own phonological rules, such as reduplication and consonant cluster simplification (see e.g. Smith 1973). Likewise, relatively little is known about children's mastery of suprasegmental aspects of phonology, including stress. Third, stress rules, unlike most phonological and morphological rules, capture generalizations about words as opposed to 'solving' alternations between different forms of the same word. As such, they pose a different, and, in some ways, less pressing problem to the child.

The acquisition of stress rules in Spanish is of particular interest because, while regularities in the stress system can be observed, the stress system is not so simple that its acquisition should be trivial; in fact, it has been suggested elsewhere that rule learning does not take place at all (Navarro-Tomas 1965:183). Stress on the penultimate syllable of vowel-final words (e.g., cuchára 'spoon'), and on the final syllable of consonant-final words (e.g., tenedór 'fork') is most frequent, and is therefore usually considered regular. However, stress can (and does) fall on any of the last three syllables of a word, regardless of the final segment of the word.[2]

In written text, the two regular stress types account for around 90% of Spanish non-verb tokens (Hooper & Terrell 1976: 67). However, this 90% figure probably overestimates the regularity of the speech heard by children, since some of the most common words (those meaning, inter alia, 'Mommy', 'Daddy', 'baby', 'here', and 'there') are irregular. Moreover, speech addressed to children and adults alike includes a substantial number of verb forms that violate the non-verb stress rules. Although children sort these out by age three or four (Graham 1977), their presence must at least initially further complicate the task of identifying the regular non-verb stress patterns.

In addition to learning which stress types are regular and which irregular, children must learn which types are prohibited entirely. Linguists (see especially Harris

1983) have identified three such types:

1) stress located more than three syllables from the end of a word (e.g., *cátapana);

2) antepenultimate stress on words with a branching rhyme (e.g., a closed syllable) in the penultimate syllable (e.g., *sósenga);

3) antepenultimate stress on words with a branching rhyme in the final syllable (e.g., *pánaguil).[3]

Method

I took a two-pronged approach to gauging children's knowledge of the Spanish word stress rules. First, I had fifty Spanish-speaking children imitate novel Spanish words minimally contrasting in stress placement. The stimuli consisted of 35 sets of 2, 3, or 4 novel words that were segmentally identical but contrasted in stress placement. These 35 sets were further divided into seven groups of five sets each, based on their length and syllable structure. As shown in Table 1, four of these groups tested regular/irregular contrasts on two- and three-syllable consonant- and vowel-final words. The remaining three contrasted the three prohibited stress types (*cátapana, *pánaguil, and *sósenga) with segmentally identical words with regular and irregular stress. These novel words were presented in random order, and the children were asked to imitate them.

Table 1
Stimulus groups for the imitation experiment

1) 5 CVCV pairs
   e.g., gága, gagá
2) 5 CVCVCV triplets
   e.g., bóchaca, bocháca, bochacá
3) 5 CVCVC pairs
   e.g., guífor, guifór
4) 5 CVCVCVC pairs
   e.g., cabádon, cabadón
5) 5 CVCVCVCV quadruplets
   e.g., cátapana, catápana, catapána, catapaná
6) 5 CVCVCCV triplets
   e.g., sósenga, soséngа, sosengá
7) 5 CVCVCVC triplets
   e.g., pánaguil, panáguil, panaguíl

In addition to these imitated speech data, I also collected spontaneous data from the same children. In order to obtain a varied sample of word types, I had the

children name objects from a specially-made picture-book which included pictures of objects depicting words both long and short, regular and irregular.

The hypothesis that children learning Spanish do formulate stress rules led to two predictions about the data. The first was that children would find words with regular stress easier to pronounce than those with irregular stress (correspondingly, in the imitation task, words with irregular stress should be easier than those with prohibited stress). The second prediction was that rule knowledge should lead children to regularize stress in words with non-regular stress.

In order to test the first prediction, I measured ease of pronunciation for the different word types in both data sets, using as a metric the percentage of structure-changing errors made. These errors included deletion or addition of segments or syllables, stress shift, or metathesis: any error that did more than alter an individual segment. To test the second prediction, I further analyzed children's structure-changing errors according to the result of the error: whether the word became more regular (i.e., shifted from prohibited to irregular or regular, or from irregular to regular), more irregular (i.e., from regular to irregular or prohibited, or from irregular to prohibited), or exhibited no change in regularity.

The fifty subjects were 3-, 4-, and 5-year-old children from Redwood City, California. They were all Spanish-dominant, and spoke Spanish at home, though they displayed various degrees of proficiency in English.

[4]

Results

The imitation data clearly support the rule-learning hypothesis. Consider first the percentage of structural errors that children made on the different stress types, as summarized in Table 2. Regular stress types were easiest to imitate: on vowel-final words children had the least difficulty with penultimate stress, while for consonant-final words, final stress was easiest. Moreover, children found the three prohibited types harder to imitate than comparable irregulars. They made more errors on *cátapana types than on catápana types (though not significantly more than on catapaná types, a point I shall return to below). And they made more errors on both *pánaguil (closed final) and *sósenga (closed penult) types than on bóchaca (open final and penult) types.[5]

Further support comes from considering the result of these structural errors. As Table 3 shows, the tendency was toward regularization. Specifically, words with regular stress were less likely to show a change in regularity than were irregulars, and these were, in turn, less likely to change than prohibiteds. This accounts for the high

percentage of prohibited words that became more regular (73%), as compared with the low percentage of regular words that became more irregular (23%). Moreover, for words with irregular stress, where a change in regularity could result in either a regular- or prohibited-stress word, structural errors were much more likely to go in the former direction than in the latter.

Table 2: Percent error on imitations
key: (r)=regular, (i)=irregular, (p)=prohibited

type (example)	stress				N
	´´´´#	´´´#	´´#	´#	
CVCV (gaga)	----	----	7(r)	23(i)	115
CVCVCV (bochaca)	----	20(i)	13(r)	32(i)	245
CVCVCCV (sosenga)	----	77(p)	42(r)	75(i)	250
CVCVCVCV (catapana)	56(p)	33(i)	14(r)	54(i)	130
CVCVC (guifor)	----	----	37(i)	18(r)	115
CVCVCVC (cabadon)	----	----	52(i)	22(r)	245
CVCVCVC (panaquil)	----	34(p)	48(i)	20(r)	250

Table 3: Results of errors on imitations

	stress type of imitated word		
result of error	regular	irregular	prohibited
became more regular	---	53%	73%
stayed the same	77%	41%	27%
became more irregular	23%	6%	---
no. of errors	291	745	352
(no. of imitations)	(1350)	(1725)	(630)

The only datum that is obstensibly unaccounted for under the rule-learning hypothesis is the fact, mentioned above, that children did not find prohibited-stressed words such as *cátapana to be significantly more difficult than comparable irregulars with final stress, such as catapaná. This fit in with a broader finding: long, vowel-final, final-stressed words were unexpectedly difficult in general. Like catapaná types, sosengá types were just as hard to imitate as corresponding prohibiteds (*sósenga types). And final-stressed bochacá and catapaná types were harder to imitate than the corresponding irregular, antepenultimate-stressed bóchaca and catápana types.

I have suggested elsewhere (Hochberg 1986, 1987) that this finding represents a problem not for the rule-learning hypothesis, but for current descriptions of Spanish stress. Children seem to have picked up on a hitherto unnoticed fact of Spanish: not all irregulars are created equal. Long V́# types are few and obscure; Whitley's extensive list (1976) of V́# words includes only six that are four syllables long. Of these, only one is common: israelí 'Israeli'. Of the remaining examples, one is borrowed and the others obscure: Misisipí, arracachá 'kind of plant', caracará 'kind of hawk', maravedí 'old Spanish coin', and zalamelé 'flattery' (Whitley 1976: 318). In contrast, many two-syllable V# words are in common use, as noted in the Introduction. This case provides an excellent example, then, of how developmental language studies can provide new insight into the structure of a language.

We now turn to the spontaneous speech data. These also support the rule-learning hypothesis, though less robustly. Children made more structural errors on irregular words than on regulars (Table 4). Moreover, when they did make errors, they showed a tendency (albeit not statistically significant) toward regularization: they were more likely to regularize irregulars than they were to irregularize regulars. A problem with this latter result is that all two-syllable, vowel-final, final-stressed irregulars that children produced -- mamá, papá, bebé, café, and sofá -- have penultimate-stressed English cognates which some of the children undoubtedly knew. If one removes these words from the data (along with their two-syllable, vowel-final, penultimate-stressed regular counterparts (e.g., cása)) the tendency noted above disappears altogether, although the first result continues to hold (see Table 5).

Table 4: Data from children's spontaneous speech

	Stress	
	regular	irregular
% structural errors	7% (1227)	16% (425)
% structural errors resulting in a change in regularity	29% (80)	39% (67)

Table 5: Data from children's spontaneous speech (excluding two-syllable vowel-final words)

	Stress	
	regular	irregular
% structural errors	9% (710)	19% (303)
% structural errors resulting in a change in regularity	32% (66)	28% (57)

The most likely explanation of the difference between the imitated and spontaneous speech data is these children have mastered both the stress system and individual exceptions to it. Thus while they did find known irregular words somewhat harder to say than known regulars, their familiarity with these words enabled them to at least stress them correctly. In contrast, when confronted with novel words in the imitation task, the children were led by their rule knowledge to regularize irregulars.

Conclusions

Several conclusions can be drawn from this research. The first is that children did learn stress rules. They did so despite the fact that, as noted in the Introduction, stress rules are less crucial to language performance than are rules needed to control common alternations (e.g. morphophonemic variation between [s], [z], and [ɪz] in the English plural). Moreover, they learned the stress rules despite the relative opacity of the stress system. In this regard the Spanish stress case is reminiscent of Guillaume's (1927) observation that children learning French extend first conjugation (-er) verb endings to other verb types even though -er verbs are the least frequent type that children actually use. It seems that children's propensity to make generalizations and hypotheses about language is so strong as to take effect even when doing so

is neither necessary nor easy.

A second conclusion is that children's stress rule learning was essentially complete by age 3. I found few age differences in the data, and none that showed an increase in stress rule awareness. Children did improve with age in their pronunciation of both bochaca and sosenga types. Older children actually showed a lessened affect of stress on bochaca types, possibly because increased exposure to irregulars rendered these more acceptable by then. Given that the three-year-old children in my study were still making segmental phonological errors such as substituting [l] for /r/, and morphological errors such as regularizing se 'I know' to *sábo (on the model of the infinitive saber), this finding validates the general understanding that the suprasegmental domain is among the first that children master.

Finally, the difference between children's performance on imitated novel words and spontaneous known words raises an important methodological point. Taken alone, the spontaneous data would not provide robust confirmation of the rule-learning hypothesis. The powerful support for this hypothesis provided by the combination of spontaneous and imitated speech data underscores the benefit of using a variety of methodologies to approach any given question.

1

This research was supported by Stanford University, NICHD 5R01 HD 18908, and NICHD HDMC 5 T32 HD07307-02 HLB. I am grateful to Eve Clark, Charles Ferguson, Paul Kiparsky, Rachel Mayberry, and Marilyn Vihman for many helpful criticisms and discussions. I am greatly indebted to the staff and students of the following Redwood City schools for their participation in my research: the Fair Oaks School, the Fair Oaks Children's Center, the Franklin's Children's Center, and the Peninsula Youth Center.

2

This description applies only to non-verbs (nouns, adjectives, adverbs, prepositions, and function words). Stress on verbs is morphologically governed, and is generally considered independently (see e.g. Harris 1983). My characterization of regular, irregular, and prohibited stress patterns is drawn from that of Harris 1983, which is the most descriptively accurate model available (see Hochberg 1987 for a comparison of Harris' and other models).

3

Antepenultimate stress with a closed final syllable is permitted, however, if that final syllable is outside the derivational stem of the word, as shown by its loss in derivation. For example, the -is of hipótesis 'hypothesis' drops when the adjectival suffix -ico is added to form the word hipotético 'hypothetical'.

4

For a full discussion of statistical analyses used, see Hochberg (1986, and in preparation).

5

One might ask whether children's greater difficulty with *sósenga and *pánaguil types (as opposed to bóchaca types) might be due to a general effect of the closed penultimate or final syllable, as opposed to an effect specific to antepenultimate-stressed words. As Table 3 shows, panaguil types were not in general harder than bochaca types, because the final consonant changed the regularity of the word. That is, regular panaguíl types were easier than irregular bochacá types, while irregular panáguil types were harder than regular bocháca types, and prohibited *pánaguil types were harder than irregular bóchaca types. In contrast, sosenga types were harder than bochaca types regardless of stress placement. Crucially, though, the difficulty posed by the closed penultimate was greater for antepenultimate-stressed words than for penultimate- or final-stressed words.

Graham, C. (1977). The development of linguistic stress in children learning Spanish as a first language. Unpublished Ph.D. dissertation, University of Texas at Austin.

Guillaume, P. (1927). Le développement des éléments formels dans le langage de l'enfant. Journal de psychologie 24:203-229.

Harris, J.W. (1983) Syllable structure and stress in Spanish: A nonlinear analysis. Cambridge, Massachusetts: MIT Press.

Hochberg, J.G. (1986) The acquisition of word stress rules in Spanish. Unpublished Ph.D. dissertation, Stanford University.

Hochberg, J.G. (1987). Acquisition data and phonological theory: the case of Spanish stress. To appear in Proceedings of the thirteenth annual meeting of the Berkeley Linguistics Society.

Hochberg, J.G. (in preparation). Evidence for rule learning in children's acquisition of Spanish stress.

Hooper, J.B., and T. Terrell. (1976). Stress assignment in Spanish: a natural generative analysis. Glossa 10:64-110.

Navarro Tomás, T. (1965). Manual de pronunciación española. Madrid: Consejo superior de investigaciones cientificas.

Smith, N.V. (1973). The acquisition of phonology: A case study. Cambridge: Cambridge University Press.

Whitley, S. (1976) Stress in Spanish: two approaches. Lingua 39:301-332.

PRCLD 26
1987

Conjunction in Children's Discourse*

Zofia Laubitz
McGill University

In this paper the role of conjunction as a textual device in children's discourse, narrative in particular, will be discussed. It will be seen that conjunction type and frequency varies according to text type, in a way that can best be accounted for within a theory of text typology.

Only conjunctions, or sentence connectives, used clausally, i.e. to connect full clauses or sentences, and not those used phrasally, i.e. to connect individual words or phrases, will be considered in this study.

Conjunction is one of the major devices used to establish cohesion in all types of texts (cf. Halliday & Hasan, 1976). One would expect that different types of text, having different functions and structures, would be characterized by the use of different types of conjunctions. As we will see, this proves to be the case, even for young children.

The text type under primary consideration here is the narrative or story. (The terms will be considered to be synonymous.) Before examining the results of the study to be described in this paper, it is important to examine the characteristics of narrative as a text type.

1. Narrative Theory

A narrative can most simply be defined as the description of a series of events, either real or imagined. Labov (1972; 360) defines a "minimal narrative as a sequence of two clauses which are temporally ordered: that is, a change in their order will result in a change in the temporal sequence of the original semantic interpretation." Clearly, then, the Labovian minimal narrative would include much discourse that would not normally be considered to be narrative, and we will be concerned with longer, more "orthodox" narratives. The concept of temporal ordering stressed by Labov, however, is generally recognized to be the primary characteristic of narrative.

For example, de Beaugrande (1980; 197), working within a text-processing framework, defines narrative as follows: "In NARRATIVE texts, the control centers in the textual world are in the main event and action concepts which will be arranged in an ordered directionality of linkage." In other words, narratives are about things that happen, and the order in which they happen is important. Here again, then, it is clear that temporal ordering is being stressed.

Another characteristic of narrative in our culture is that it is generally a monadic form of discourse, that is, it generally has the form of a monologue rather than a dialogue. This is the case for adults' narratives, at any rate. Young children, however, tend to require more input from their interlocutor, making the story-telling situation more of a dyadic one. This will be found to have less influence on the use of this linguistic device than might have been expected, though.

Given the fact that temporal ordering of events is the crucial defining characteristic of narrative, one would expect that this would be encoded linguistically, affecting the structure as well as

the content of this text type. As far as the specific device of conjunction is concerned, narrative should be characterized by the use of temporal connectives like when, then, after, while, etc., and in particular by the use of sequential temporal conjunctions, used to encode the fact that events are being recounted in chronological order. The main sequential temporal connectives are then, and with its asymmetric or temporal function, and the combination and then.

2. The Study

The data to be examined here were collected for a project on children's acquisition of textual devices, headed by Myrna Gopnik; this study is one component of the larger project. In the course of this project, discourse was collected from 34 children aged 2 to 5 years old. All children were enrolled at the McGill Daycare Centre.

Different types of discourse were elicited as follows: for the collection of stories, each child was shown one of three picture books devised for this project and asked to tell a story about the events depicted in the book. The children were also asked to tell a story without the aid of any visual stimuli, i.e. a story about some personal experience, a fairytale, etc. The stories with and without visual stimuli are referred to as prompted and free stories respectively.

The children were also asked a set of questions about the prompted stories, to determine whether they had comprehended the pictures. In addition to the stories and question sessions, they were asked to explain how to play a game, in an attempt to collect explanatory discourse. Their conversations with the interviewer made up the final text type examined.

The length of each child's session with the interviewer and the number of types of discourse elicited varied according to his or her own interest in the tasks involved. Some children, especially the younger ones, hardly talked at all. Others talked freely but did not produce anything that could be considered as a story, even though their comprehension of the picture books was indicated by their good performance on the question sessions. Yet others conversed long and fluently and, in addition, produced a number of stories.

For the purpose of this study, I used a working definition of a narrative as several sentences describing an event or sequence of events, and not interrupted by substantive prompts on the part of the interviewer. (In other words, the interviewer did not have to say anything with more content than "What happened next?" or "And then what did they do?" to get the child to continue his story.) The general criterion was that if the interviewer's contributions were removed, the child's story should still seem coherent and not clearly be half a conversation or a series of answers to questions.

Conversation is defined in a fairly catch-all way here, being deemed to be any discourse which does not fall into one of the other categories (i.e. story, explanation, question and answer session). Failed attempts at stories or explanations were considered as conversation for the purpose of analysis.

After the data were collected and transcribed, two types of analysis were done in order to determine the type and frequency of conjunctions found in each text type. First a gross frequency analysis was done, to determine the frequency per 1000 words of each conjunction used in each text type. Secondly, the percentage of clauses headed by one or more conjunctions was also determined for each text type. The results of these analyses are given below.

2.1 Frequency Analysis

The first type of analysis was used to determine the total frequency of clausal conjunctions as a word class in each of the types of discourse examined. After word counts were done, the frequency of each conjunction was calculated in occurrences per 1000 words; the resulting indices are easily comparable for each discourse type and each age group.

In the total amount of discourse collected from the children, it was found that the two year olds hardly ever use conjunctions (their results will, therefore, not be shown in the tables), and that the three year olds use fewer different conjunctions than the four and five year olds and use them significantly less frequently. The four and five year old children, however, use 15 different conjunctions belonging to all four semantic groups characterized by Halliday & Hasan (1976): additive, adversative, causal, and temporal. And is the most frequently used conjunction, which is in accordance with the results found for adults by Beaman (1984), as well as being intuitively the expected result.

Tables 1 and 2 show the frequency indices for conjunctions in conversation and narratives respectively, first for all children, then for each age group. It can immediately be seen that these differ quite strikingly for the two text types. Connectives as a class are far more frequent in narrative than in conversation, being approximately three times as frequent for the children as a group. The frequency differences between text types are statistically significant at all ages.<1>

No firm conclusions about the relationship between conjunction frequency and children's age can be drawn for these two text types, though. In both cases, the fours show a different rate of usage than the threes and fives, higher for conversation but lower for narrative.

The relative frequencies of different semantic classes of conjunctions will be discussed below.

2.2 Clausal Frequency Analysis

Although an analysis of overall conjunction frequency reveals that narrative and conversation differ markedly in this regard, it might be the case that this is not linked directly to text type. This could be so if it turned out, for instance, that conversation is more "fragmentary" in nature than narrative-- possibly as a result of its dyadic structure-- with a speaker's conversational discourse comprising a greater number of utterances consisting of single lexical items or phrases and fewer complete clauses or sentences. If this were the case, then the profusion of clausal connectives used in narrative would be seen to be simply the result of the greater number of clauses used in narrative, and could not in itself be seen as a linguistic manifestation of the nature and function of any text type. Therefore, it is clearly necessary to determine what percentage of the full clauses in each discourse type is actually headed by a conjunction, rather than only determining the gross frequency of that word class.

A count was carried out of all the clauses in the sample. Since certain types of clauses, e.g. relatives and control clauses, cannot be headed by a conjunction,<2> these were then eliminated from the total count. Thus the number and percentage of conjoinable clauses that were in fact headed by one or more conjunctions was determined.

Tables 3 and 4 show the results of this analysis for conversation and narrative. There is a considerable difference in

Table 1

Conjunction Frequency in Conversation

All	No.	Freq./1000
and (total)	151	17.44
and (symm.)	94	10.86
and (asymm.)	57	6.58
but	90	10.39
because	52	6.01
then	45	5.19
when	23	2.66
so	15	1.73
if	6	.69
after	3	.35
though	1	.12
or	1	.12
while	2	.23
Total	389	44.93
Total words = 8658		

Threes		
and (total)	28	17.36
and (symm.)	13	8.06
and (asymm.)	15	9.29
but	13	8.06
then	10	6.19
because	8	4.96
after	1	.62
so	1	.62
Total	61	37.82
Total words = 1613		

Fours		
and (total)	96	20.71
and (symm.)	62	13.37
and (asymm.)	34	7.33
but	62	13.37
because	31	6.69
then	27	5.82
when	17	3.67
so	8	1.73
if	6	1.29
or	1	.22
while	1	.22
Total	249	53.71
Total words = 4636		

Fives		
and (total)	26	11.98
and (symm.)	18	8.29
and (asymm.)	8	3.69
but	15	6.92
because	12	5.53
then	8	3.69
so	6	2.76
when	6	2.76
after	2	.92
though	1	.46
while	1	.46
Total	77	35.47
Total words = 2171		

Table 2

Conjunctions in Stories

All	No.	Freq./1000
and (total)	269	70.79
and (symm.)	43	11.32
and (asymm.)	226	59.47
then	166	43.68
so	32	8.42
because	15	3.95
but	10	2.63
when	6	1.58
if	2	.53
before	1	.26
except	1	.26
as	1	.26
Total	503	132.37
Total words = 3800		

Threes		
and (total)	14	87.5
and (symm.)	1	6.25
and (asymm.)	13	81.25
then	6	37.5
so	1	6.25
Total	21	131.25
Total words = 160		

Fours		
and (total)	144	62.15
and (symm.)	29	12.52
and (asymm.)	115	49.63
then	83	35.82
so	21	9.06
because	12	5.18
but	9	3.88
when	5	2.16
if	2	.86
before	1	.43
as	1	.43
Total	278	119.98
Total words = 2317		
Fives		
and (total)	111	83.9
and (symm.)	13	9.83
and (asymm.)	98	74.07
then	77	58.2
so	10	7.56
because	3	2.27
but	1	.76
when	1	.76
except	1	.76
Total	204	154.19
Total words = 1323		

Table 3

Conjoined Clauses in Conversation

	No. Clauses	No. Conjoined	% Conjoined
All			
Total	1447	330	22.8
Conjoinable	1308	330	25.2
Twos			
Total	40	1	2.5
Conjoinable	40	1	2.5
Threes			
Total	294	54	18.4
Conjoinable	266	54	20.3
Fours			
Total	807	211	26.2
Conjoinable	729	211	28.9
Fives			
Total	306	64	20.9
Conjoinable	273	64	23.4

Table 4

Conjoined Clauses in Stories

	No. Clauses	No. Conjoined	% Conjoined
All			
Total	693	354	51.1
Conjoinable	614	354	57.7
Threes			
Total	24	15	62.5
Conjoinable	24	15	62.5
Fours			
Total	439	204	46.5
Conjoinable	383	204	53.3
Fives			
Total	230	135	58.7
Conjoinable	207	135	65.2

the frequencies of clauses with conjunctions in the two text types. The percentage of conjoinable clauses that are actually conjoined is approximately 25% for all children in conversation, close to 60% for all children in narrative. The difference between the two text types is significant for all age-groups.<3>

One must bear in mind that, in this analysis, the frequency of clauses headed by one or more conjunctions is determined. This accounts to some extent for the fact that conjunction frequencies for the two text types are rather closer than they appear with the other analysis: a number of clauses, particularly in stories, actually start with a combination of connectives, e.g. and then, so then. Narratives tend to have a very high density of conjunction usage; in many of the shortest stories, in fact, virtually all clauses following the introductory one are headed by a conjunction or conjunction cluster.

The results of this analysis would seem to indicate that the difference in conjunction frequency in the two text types is not related to any putative difference in the frequency of the number of full clauses in the two text types. Rather, it is clearly an independent factor that must be separately motivated.

2.3 Types of Conjunctions

Given that it has been stressed that the prime characteristic of narrative is temporal ordering, it is of great importance to determine whether the type of conjunctions used differs in this text type, as well as the frequency. In particular, do temporal conjunctions occur more frequently in narrative than in conversation? For this reason, the ratio of sequential temporal conjunctions to all other conjunctions was determined for each text type.

In narrative, as was predicted, sequential temporal conjunctions are the most commonly used, making up approximately 80% of the total conjunctions used by the children as a group. In conversation, on the other hand, the sequential temporal class makes up only about 25% of the total conjunctions used by the children as a group. The difference in frequencies is significant at all ages.

In addition, the relative frequencies of the symmetric and asymmetric (or temporal) uses of and were determined. In narrative it was found that asymmetric and predominated, accounting for approximately 85% of all the occurrences of and. In conversation, on the other hand, symmetric and was used more frequently, accounting for approximately 60% of the total occurrences of and. Thus, it can be seen that one specific conjunction, and, which has very low semanticity (cf. van Peer, 1984) and can assume virtually any connective function, is found to mirror the total pattern of conjunction use, being most frequently used as a temporal connective in narrative, but as a non-temporal connective in conversation. This is as one would expect.

3. Discussion

To sum up the results of this study, then, children aged three to five use sentential conjunctions far more frequently in narratives than they use them in conversations. In addition, the children use sequential temporal conjunctions overwhelmingly frequently in narrative, whereas these conjunctions do not occur particularly frequently in conversation.

These results would appear to indicate that at least as early as four years old, and probably as early as three, the children have a

conception of narrative as a text type, having not only a particular content and function but also a particular linguistic form. More specifically, they appear to be aware of the crucially temporal nature of narrative, to feel that this temporal ordering should be linguistically encoded, and to know that the most economical and unambiguous way of encoding temporal order is to use temporal conjunctions, particularly sequential temporals. These, as we have seen, they use very copiously.

It would be possible to tell a story without using any conjunctions, simply enumerating events in chronological order. The Gricean maxim of orderliness (Grice, 1975) would ensure that the unmarked way of interpreting such a narrative would be the correct one; unless there is overt evidence to the contrary, one assumes that the order of narration corresponds to the true order of events. This, however, would appear to be a marked type of narrative; it is more usual to use more overt means of encoding temporal ordering.

Children appear to realize this and to use conjunctions as such a means. Although their stories differ in many ways from adults' stories, being both less coherent and less cohesive, i.e. differing both in content and in linguistic form, they do grasp the essence of narrative--that it is about events happening in a particular order--and they do successfully encode this.

It is for this reason, probably, that narrative and conversation differ not only with respect to the type of conjunctions used but also with respect to the frequency of conjunction usage. Conjunctions as a word class are, as we have seen, far more frequent in narrative than in conversation. The children appear to feel that it is important to overtly encode the relationships between events in their stories, and they do this by means of the relevant linguistic device. Temporal links are therefore consistently and unambiguously encoded, and the story is welded into a linguistic whole, by means of the frequent use of temporal conjunctions. The "ordered directionality of linkage" is thus made completely transparent.

To generalize from this, what the children appear to be doing is showing a grasp of the concept of text as an entity not only communicative but also linguistic. They know that specific linguistic devices are appropriate in specific types of text, and to a great extent, they use these devices appropriately.

Notes

* In preparing this paper, I have benefited greatly from discussions with Myrna Gopnik, Lisa DeMena Travis, G.L. Piggott, Michel Paradis, Eithne Guilfoyle, and Jo-Ann Gendron. Myrna Gopnik's Text Acquisition Project was funded by FCAR grant No. EQ-2318; in addition, my own research was funded by a McConnell Fellowship (McGill University) and by an SSHRCC Doctoral Fellowship, No. 452-86-4300, for which I am extremely grateful. My trip to the 1987 Stanford Child Language Research Forum, at which this paper was presented, was financed by a McGill University travel grant, for which I am also grateful.

1. The chi-square results for the comparison of conversation and narrative are as follows: 3 year olds, $X^2(1,1773)=28.81$, $p<.001$; 4 year olds, $X^2(1,6953)=96.86$, $p<.001$; 5 year olds, $X^2(1,3494)=156.69$, $p<.001$.

2. Although it is possible to conjoin relative and control clauses with each other (e.g. in (i)), the first such clause of a sequence may not be headed by a conjunction (cf. (ii)):

   i.a The man who lived in that house and who later vanished
   b I want to go swimming and to go to the movies

   ii.a *The man and who lived in that house...
   b *I want and to go swimming...

3. For this analysis, the comparison of conversation and narrative yielded the following results: 3 year olds, $X^2(1,359)=10.43$, $p<.01$; 4 year olds, $X^2(1,1527)=27.65$, $p<.001$; 5 year olds, $X^2(1,679)=34.37$, $p<.001$.

References

Beaman, Karen (1984) "Coordination and Subordination Revisited: Syntactic Complexity in Spoken and Written Narrative Discourse," in Coherence in Spoken and Written Discourse. Ed. D. Tannen. Norwood, N.J.: ABLEX Publishing Corp.

de Beaugrande, Robert (1980) Text, Discourse, and Process: Toward a Multidisciplinary Science of Texts. Norwood, N.J.: ABLEX Publishing Corp.

Grice, H.P. (1975) "Logic and Conversation," in Syntax and Semantics, Vol. 3: Speech Acts. Eds. P. Cole & J.L. Morgan. New York: Academic Press.

Halliday, M.A.K. & Ruqaiya Hasan (1976) Cohesion in English. London: Longman.

Labov, William (1972) "The Transformation of Experience in Narrative Syntax," in Language in the Inner City. W. Labov. Philadelphia: University of Pennsylvania Press.

van Peer, Willie (1984) "Toward a Pragmatic Theory of Connexity: an Analysis of the Use of the Conjunction AND from a Functional Perspective." Tilburg Papers in Language and Literature, No. 56.

PRCLD 26
1987

Vocal Motor Schemes

Lorraine McCune
Rutgers University

Marilyn May Vihman
Stanford University

At the early transition to speech, children's vocalizations show certain phonetic tendencies, such as frequent use of stops and nasals and scant use of liquids or clusters (Locke, 1983; Oller, Wieman, Doyle & Ross, 1976). Despite intensive study of this transition, the order of emergence of phonemic contrasts in words proposed by Jakobson (1941/1968) has been difficult to evaluate (Kiparsky & Menn, 1977). Rather than a discontinuity between babbling and early words, as Jakobson assumed, word and non-word vocal productions co-occur and have the same phonetic properties (Vihman, Macken, Miller, Simmons & Miller, 1985). There is no evidence for a universal order of consonant acquisition during this period. Nor is it clear how competence in intentional production could be evaluated in non-word vocalizations, where the child is not attempting an identifiable target.

The present study was designed to examine the extent to which consistency in consonant use characterizes the transition period. The results indicate that rather than a universal sequence of acquisition of consonants in words, there may be a universal tendency to establish a limited range of intentional vocal patterns prior to word use, with strong individual differences in the segmental basis of these patterns. Children's use of what seemed to be their "favorite sounds" (Ferguson, 1979) suggested that these were the basis for action schemes as described by Piaget (1962). They are motor acts which are performed intentionally and are capable of variation and combination to form larger units. The present paper documents the establishment of these vocal motor schemes and examines their influence on the form and rate of word acquisition.

Method

Data were collected at Rutgers and at Stanford from 5 boys and 5 girls each, aged 9 to 16 months. The Rutgers children were videotaped monthly in the home during free-play mother-child interactions with a standard set of toys. For the Stanford sample, audio and video recordings were made weekly in the home

(Vihman et al., 1986). These data are being further analyzed by the methods described here to provide a replication of the present study. Phonetic transcriptions were made of the monthly Rutgers data. Reliability across the two transcribers was checked on the basis of five partial re-transcriptions, covering the age-range 10-15 months (218 vocalizations). Agreement as to length in syllables and place and manner of supraglottal consonants averaged .743 (1,011 data points). We counted the occurrences of consonants in syllable-initial position and the number of vocalizations lacking a syllable-initial consonant. Consonants occurring more than once in a vocalization were counted only once. Voicing in stops was not distinguished (e.g., [p] and [b] were treated as the same consonant).

Results

The proportional distribution of consonants revealed striking segmental preferences in all 10 children. Individual proportions and means are shown in Table 1. The most prominent segments for the sample as a whole, [h] and [t/d], served as vocal motor schemes for a majority of the children. Each of the other segments in Table 1 showed extreme use, in comparison to the sample mean, for one or more subjects. This narrow range of frequently used segments reflects the phonetic properties previously observed by Oller et al. (1976) and Vihman, Ferguson & Elbert (1986), while variation by child, even within this narrow range, suggests strong individual differences.

We next determined which segments were used with sufficient frequency and longevity to indicate competence in intentional production. Vocal motor schemes were identified by inclusion of a consistent segment in 10% (and 10 or more) of the child's vocalizations for each of three sessions, either contiguous or separated by no more than one session. This definition controls for variation in volubility (range 9-260 vocalizations in per session). The vocal motor schemes used by the children and the number of months each was used appear in Table 1.

Vocal Motor Schemes and Word Forms

If vocal motor schemes, like the action schemes described by Piaget, are capable of variation and combination in the service of goal-directed activities, such variation and combination should be exhibited in the children's phonological approaches to shaping an initial lexicon. Profiles of two of our most voluble subjects, Aislinn (Rutgers) and Molly (Stanford), illustrate the different kinds of relations found

between vocal motor schemes and the form of early word productions.

Aislinn was the only Rutgers child with a preference for [j] (yod), as shown in Table 1. Longitudinal examination of her consonant use indicated that early use of yod was the first manifestation of a range of production skills united by a focus on palatal (or high-front-vowel-like) articulation. These palatal patterns constituted a series of vocal motor schemes in non-words and apparently exercised strong influence on both production and selection of words. Looking at Aislinn's word tokens at 14 months, for example, we find several manifestations of a palatal pattern:
- use of yod: lady -> [jeiji]
- use of palatal consonants: mommy -> [ma:ɲi]
- use of Vi : eye, hi, bye.
- use of (CV)Ci: bunny -> [baeŋ:i].

Noting that these word patterns might be related to the unusual prevalence of yod in Aislinn's babble at 9 and 10 months, we traced these palatal sub-patterns longitudinally in babble as well as words.

On average, Aislinn's palatal pattern affected over one-third of her vocalizations (Figure 1). When word use became well-established, after 13 months, palatal articulation characterized an overwhelming majority of her word tokens (75%-85%). Furthermore, a more detailed look at the formation of the palatal pattern in non-word vocalizations showed that, beginning with high use of [j] at 9 and 10 months (17/30; 57%), Aislinn gradually built up more complex i/j-based patterns such that at 11 months the Vi pattern began to be used most (15/31; 48%) and from 14 months on the CVCi pattern was dominant, accounting for 35%-55% of the non-word palatal articulations.

It should be noted that some words showed phonological regression, in comparison with the adult model, as they were integrated into Aislinn's preferred pattern. For example, mommy changed from [man:ə] (10 mos.) and [mɔɛ] ~ [ɛ̃ mãmamə] (12 mos.) to [maji] (15 mos.) and [ma:ɲi] (16 mos.). At the same time, new words were typically shaped into palatal patterns - e.g., ball [pɔɛi], whoo [ɲui] (12 mos.), blanket [baeŋ:i] (14 mos.), elephant [aijʌ̃] (15 mos.), [ai·njə] 16 mos.

By way of contrast, Molly used similar palatal articulations, but vocal motor schemes integrating them into a pattern were not apparent in her data. There is a gradual increase in i-like articulations, but words do not lead the trend and the overall frequency is far lower (Figure 1).

For Molly, the analysis of phonetic tendencies presented in Vihman et al. (1986) showed a concentration on final consonants which became a framework for vocal motor schemes. Molly made 23% use of final consonants at the point when she began using over 15 words per session (age 12-13 months), as compared to a mean use of final consonants, at that lexical level, of 10% across 7 subjects. Longitudinal analysis of Molly's word patterns revealed a focus on final consonants as early as 10 months, when cracker was produced with variants [wæɛk^{ɛ}] ~ [kæɛk^{ɛ}] ~ [kʌk^{ɛ}] alongside vowel-final disyllabic variants such as [pæɛkwa]. At 12 months over half of Molly's word tokens (22/41) made use of final consonants: e.g.,

baby -> [pe:p]
good girl -> [kukʌk]
oops -> [ɛp]

When Molly's lexical output increased sharply at 13 months she began to use a new pattern for final stops and nasals. The pattern involved emphasis of the final consonant - extra long aspiration for a stop, lengthening for a nasal - and the addition of a final vowel, either [i] or [ɪ]. E.g.:

clock -> [kak:^{h}ɪ]
bang -> [bæŋ:i] ~ [bæɛini]

In later sessions Molly continued to increase her use of final consonants, drawing words with nasals (green, Graham, Nicky) into her nasal pattern ([kɛn:i], [kɔn:i] and [ɛn:i], respectively) but also adding other stop-final words (red, stuck), and producing [t] for final voiceless fricatives (bus, house, cheese, Ruth).

Figure 2 shows Molly's dramatic increase in use of final consonants in words over time, up to a remarkable 47% at 16 months. In contrast, Aislinn shows a consistently low level of use, though there is a slight increase in words at 16 months, to 11%. The fact that both girls show higher use in words no doubt reflects the fact that English is a language particularly rich in final consonants.

The difference in word selectic is striking. Aislinn made heavy use of diminutive (Ernie, Bonnie) and baby-talk words ending in -y (bunny, daddy, dolly), which exhibit a palatal pattern. We can speculate that these relatively high frequency English words attracted Aislinn because of her favorable predisposition toward palatal patterns, and that it was the interactive match between child scheme and adult phonological structure which produced Aislinn's extremely high frequency pattern at 14-15 months.In contrast, Molly used few palatal pattern adult words, focussing instead on words with final consonants.

Specifically, in Molly's first month of high lexical use, she targetted 9 obstruent-final words out of 15 non-onomatopoeic words, while at a comparable lexical point Aislinn targetted only 4 obstruent-final words out of 21 different non-onomatopoeic words.

Vocal Motor Schemes and Lexical Progress

Although the definition of vocal motor scheme makes no reference to a meaningful or communicative use of these patterns, the examples from Aislinn and Molly show how the capability for intentional production of a sound pattern can be used by a child in the acquisition of words. Equally interesting was the fact that the two Rutgers subjects who did not develop a supraglottal vocal motor scheme by 16 months were low in word production over the course of the study. We therefore investigated the relationship between the children's use of vocal motor schemes and their development of a referential lexicon.

To obtain vocal motor scheme scores we summed across months and corrected the raw total to account for variation in number of observation sessions (Table 1). Aislinn, for example demonstrated vocal motor schemes for [p/b], [t/d], [j], and [h] for a pooled sum of 22 months. Division by number of observation sessions (8) yielded a corrected vocal motor scheme score of 2.75.

The referential lexicon was defined as the total number of strong nominal and relational word types used by the child in the course of the study. Strong nominals are words used with reference to several different entities which would constitute exemplars of some adult concept (e.g., dog referring to a picture and to a neighbor's dog). Relational words refer to reversible spatial or temporal events (e.g., allgone when a cookie has been eaten, no when a puzzle piece won't fit.) Occurrences in different contexts are required (McCune-Nicolich, 1981), indicating a basis of meaning beyond the routine. (See Table 1).

Vocal motor scheme use and referential lexical development were significantly related (Spearman Rank Correlation .78, $p < .01$), as were volubility and referential lexicon (.67, $p < .05$), while volubility and vocal motor scheme use were not (.49, N.S.). Although higher volubility should make vocal motor scheme identification more likely, volubility is insufficient to account for the relationship with lexical development. In fact, the pattern of correlations obtained suggests that the the child's active construction of intentional patterns (vocal motor schemes) contributes to lexical development in a

way which goes beyond simple high frequency vocalization (volubility).

Discussion

The children in this study all developed an early and continuing preferential use of one or more segments. Unlike the more general tendencies described by Locke (1983) these individual preferences formed the basis for vocal motor schemes. For some children these developed a syllabic structure, of one or more units. Although the present paper investigated consonant-based schemes, in principle vowel shapes and prosodic patterns might also be exploited in the formation of vocal motor schemes.

The earliest vocal motor schemes have no apparent meaning for the child as words later will. Rather, it seems that the children have achieved competence in controlling articulation to produce forms based on a given segment. In the case of vocal motor schemes based on supraglottal articulation, the children have considerable scope for playful variation and combination of a range of interrelated motor acts. Where a vocal motor scheme is based on glottal articulation (e.g., [h], [ʔm̥]) however, the possibilities for exploration are more limited.

How do these playful vocal explorations relate to the development of early meaningful language? Here we invoke the Wernerian notion of "shift in function" (Werner & Kaplan, 1963). Vocal motor schemes first develop as a pleasurable activity in the course of exploring vocal capacities. This ability to form patterned but somewhat flexible articulatory plans can, however, shift function and become the basis for forming early words. This is demonstrated in the increase in palatal articulation or final consonants in words as opposed to non-words (Figure 1). When the child intends to represent a meaning by vocalization an automatized articulatory pattern provides a useful vehicle for simplifying the motor aspects of this complex cognitive task. Thus new vocal motor schemes suiting the vocal repertoire to specific aspects of language learning arise.

Whereas exploration with non-word vocal motor schemes is free and playful, as word schemes develop the same capacity for variation can be centered on particular word forms as targets. The simplicity of phonological shapes characterizing early words and the similarity of the phonetic tendencies exhibited in word use to those seen earlier in non-word vocalizations suggest that the earliest words may themselves be characterized as enriched vocal motor schemes invested with meaning.

Table 1. Use of vocal motor schemes by individual children.

S (N sessions)	Mean % use (N sessions of high use)						VMS score	Lexical score
	p/b	t/d	j	w	h	ʔm/ʔn		
Ai(8)	24(7)	12(5)	13(5)	06	13(5)	07	2.75	27
An(6)	00	04	01	01	50(4)	05	.66	0
Da(6)	06	24(3)	03	10	10	05	.5	0
JJ(8)	06	12(3)	07	08	14(5)	17(8)	2.0	5
Je(8)	05	07	05	08	33(7)	09	.88	1
Jo(7)	09	16(6)	06	09	17(4)	11(4)	2.0	2
Ka(7)	04	28(5)	04	03	13	07	1.14	2
La(6)	16	13(6)	04	12(3)	30(8)	04	2.83	11
Lu(8)	05	21(5)	07	04	14(4)	05	1.13	12
Pa(6)	11	23(8)	05	06	14(5)	06	2.13	8
mean	10	17	06	07	18	08		

VMS score = no. of mos. used as VMS, corrected for no. of sessions
Lexical score = total no. of strong nominal and relational words

References

Ferguson, C.A. (1977). Phonology as an individual access system. In C.J. Fillmore, D. Kempler & W.S-Y. Wang (Eds.), Individual Differences in Language Ability and Language Behavior. N.Y.:Academic Press.

Jakobson, R. (1941/68). Child Language, Aphasia, and Phonological Universals. Tr. by A.R. Keiler. The Hague, Mouton,

Kiparsky, P. & L. Menn. (1977). On the acquisition of phonology. In J. Macnamara (ed.), Language Learning and Thought. N.Y.: Academic Press.

Locke, J. (1983). Phonological Acquisition and Change. N.Y.: Academic Press.

McCune-Nicolich, L. (1981). The cognitive bases of relational words in the single word period. Journal of Child Language 8.15-34.

Oller, D.K., Wieman, L.A., Doyle, W.J., & Ross, C. (1976). Infant babbling and speech. Journal of Child Language 3.1-11.

Piaget, J. (1962). Play, Dreams and Imitation in Childhood. N.Y.: W.W. Norton.

Vihman, M.M., Ferguson, C.A., & Elbert, M. (1986). Phonological development from babbling to speech. Applied Psycholinguistics 7.3-40.

Vihman, M.M., Macken, M.A., Miller, R., Simmons, H. & Miller, J. (1985). Fom babbling to speech: A re-assessment of the continuity issue. Language 61.397-445.

Werner, H. & Kaplan, B. (1963). Symbol Formation. N.Y.: Wiley.

Figure 1. Palatal pattern

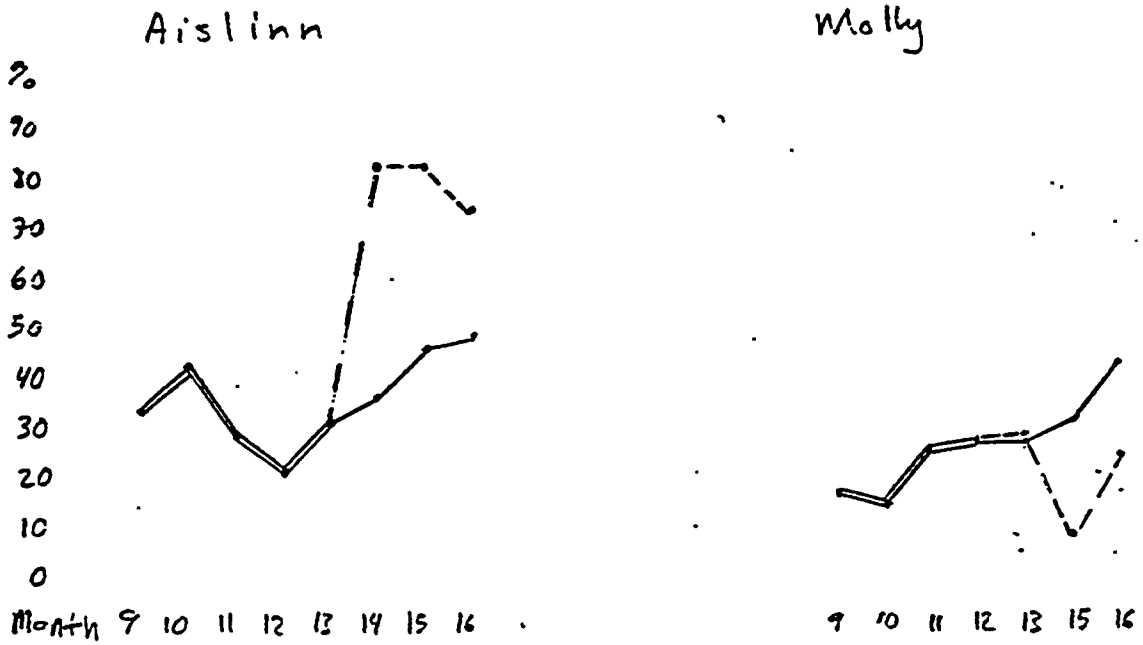
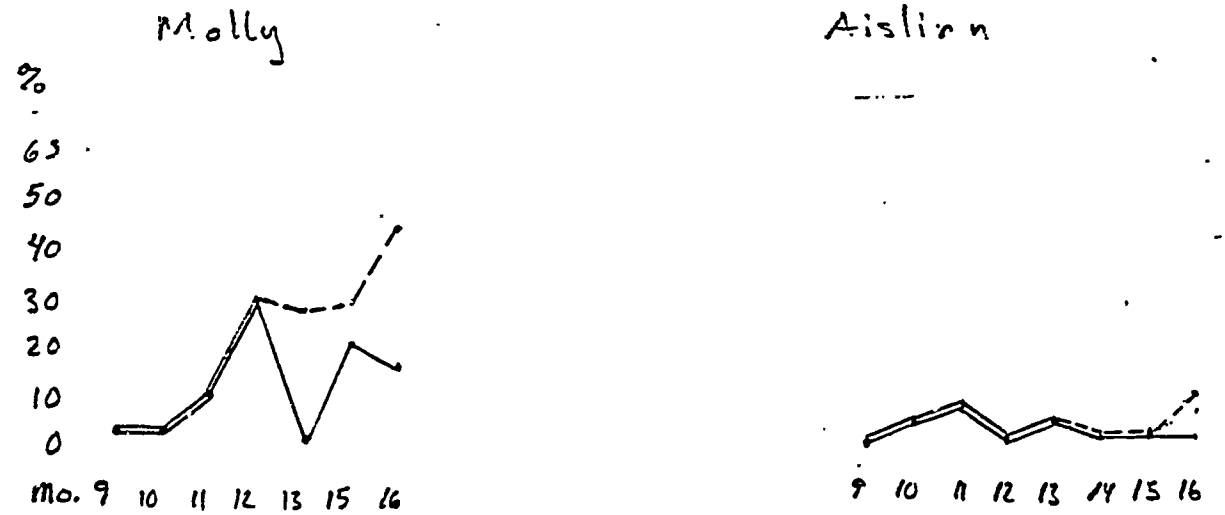


Figure 2. Final consonant use



Key: ═══ = non-word + word use
——— = non-word use
- - - - = word use

PRCLD 26
1987

Time-binding in mother-child interactions: The morphemes for future and past.

Ernst L. Moerk & Rosa M. Vilaseca
California State University, Fresno

Profound paradigmatic changes have been and are occurring at present in the field of developmental psycholinguistics. Since the emphasis of Bolinger (1976) on formulaic speech and Braine's (1976) demonstration of 'limited scope formulae' in infant speech, the research community has again become alert to the fact that by far not all utterances are produced by rule-governed processes. Accordingly, McWhinney (1978) postulated three possible processes in first language acquisition: 'rote,' 'analogy,' and 'rule.' More recently, the principle of pattern abstraction, McWhinney's 'analogy,' has received extensive scrutiny and support in the studies of Rumelhart & McClelland (1985) and Bybee and Slobin (1982) who demonstrated that a considerable amount of phenomena observed in the acquisition of temporal morphemes might be due to such pattern abstraction as contrasted to rule learning.

With these emphases upon processes, an integration of two research trends becomes possible: The study of (a) psychological processes and (b) of the interactional processes between adult and child that lead to learning and support the cognitive processes employed by the child as postulated by Vygotsky (1978) and Bruner (1983). This research, initiated by Moerk (1972) and Snow (1972) and elaborated upon especially by Cross (1977, 1978) explores these interactions in a microlongitudinal manner to show how interactional processes guide and define cognitive processes in the child. Interactions entail relational information, as contrasted to punctuate aspects, as emphasized by Cross (1977), Moerk (1983), Shatz (1982), and Snow (1977). Feedback in the form of corrections (Demetras, Post, & Snow, 1986; Hirsh-Pasek, Treiman, & Schneiderman, 1984; Moerk, 1983) is part of this relational information. The old controversy as to 'the effect of imitation' and the definition of 'imitation' can be resolved (see: Snow, 1983 and Moerk, 1985) by demonstrating that similarity to the model and temporal delay are two dependent variables in the model-imitation interactions that indicate the degree of storage and independent retrieval in the child.

Taking into account these promising developments, the present study focuses upon a domain, the English morphemes for future and past, for which the necessity of learning is uncontroversially accepted, and explores the teaching/learning processes that lead to the acquisition of these morphemes.

Method

The extensive transcripts of R. Brown, pertaining to Eve's interactions with her mother, were reanalyzed to explore

psychological processes and mutual influences in the transmission and acquisition of temporal morphemes. The analyses were focused upon the age period of 22-27 ms, with a MLU range between 2.75 and 4.0, a period of active acquisition of these morphemes. Longitudinal microanalytic and macroanalytic methods were combined to study immediate cause-effect relationships as well as more extended learning periods and long-term incremental processes that led to improvements in filial performance.

Results

An overall impression of the acquisition process can be gained from a longitudinal survey over the entire period studied combined with an attempt to discern interactional dynamics. This is presented in Table 1.

Table 1

Frequencies per Hour of Use of Future Morphemes

	Morpheme	S 9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19
Adult	will/'ll shall/'ll	16	14	16	10	18	23	19	24	17	30	32
	going to/ gonna	6	4	5	12	4	7	11	6	14	18	14
Child	go + verb	1	2	3	15	6	6	12	15	5	7	1
	going to gonna	1	3	1	1	1	2	3	5	3	6	7
	will/'ll shall/'ll	1	1	0	1	1	5	1	3	1	5	10

The increase with age in most of the phenomena is easily visible from an inspection of the data. The correlation coefficents range in the 70's and 80's. The one instructive exception pertains to Eve's "go"+ verb, such as "go get," "go bring." This semantically most transparent expression of a future intention, describing both the preparatory locomotory and the goal action, reaches an early peak in sample 12, increases once again, and then declines steeply toward the end of the recording period. Interactionally, a lead-lag relationship between Eve and her mother can be overserved. After Eve's peak in S 12, the mother steeply increase her models of "will/shall" after a lag of one sample; and again, after Eve's second peak in samples 15 and 16, the mother adds another spurt after a lag of two samples. A similar increase in maternal models of "going to/gonna" follows in sample 17, i.e., after a lag of one sample. In both cases, Eve indicates her readiness for the expression of the future, though through a semantically transparent morpheme, and her mother responds by modeling the linguistically preferable morphemes. The high

correlations between Eve's common future morphemes and age show the cumulative effects of input and exercise frequency.

Table 2 presents a first attempt to differentiate more finely probable causative factors that lead to filial progress; this time in regard to the regular past.

Table 2

The More Frequent Verbs Taking the Regular Past Employed in Contexts where the Past is Obligatory

Verbs	Frequencies Adult	Frequencies Eve Correct	/-ed/ missing	Total	% Eve Correct
Happen	28	7	3	10	70
Say	15	10	4	14	71
Fix	10	3	4	7	42
Spill	7	11	3	14	78
Fold	7	7	0	7	100
Drop	5	3	6	9	33
Use (used to)	5	0	-	0	-

Frequency effects again become quite plausible as seen by comparing Adult Frequency and Percent Correct. The correlation is, however, only .33, indicating that other factors interact with input frequency. Acoustic distinctiveness seems most decisive, as seen in the case of "folded" which alone reaches 100 percent correctness. This is the only verb in Table 2 wherein the past tense is formed with the "-ed" allomorph. A preliminary rank-ordering of the six verbs Eve used, according the acoustic distinctiveness of their past tense suffixes, resulted in a rank order correlation with Percent Correct of .94. Pragmatic factors arise in "spill" and "drop," since both verbs are predominantly employed to describe Eve's own actions. They are used more often than mere input frequencies would lead to expect. Yet, these factors, combine with acoustic distinctiveness, the dental suffice being more distinct after /l/ than after /p/, resulting in a higher level of correct performance for "spilled." Finally, semantic opacity, as in the past tense of "use" in the form of "used to," is important. This phrase is never employed by Eve, in spite of its input frequency being the same as for "dropped." Most generally, it needs to be emphasized how the results in Table 2 argue against involvement of rules in Eve's performance. Whether with the same vocabulary items or with different ones, Eve's provision of the past morpheme is not reliable, as rule-governed behavior should be. Other variables, whether in models or in feedback, influence Eve's productions.

Since Eve employed diverse forms to express future intent and was differentially successful in producing the past-tense suffix, where obligatory, it is of great interest how her mother responded to these attempts. This maternal feedback is summarized in Table 3.

Table 3

Maternal/Adult Feedback to Eve's Spontaneous Utterances

	Utt. type	S 9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19
F	Morpheme omitted	3‡ / 17	0 / 6	0 / 7	5 / 7	6 / 13	0 / 11	2 / 12	2 / 10	3 / 10	10 / 12	0 / 11
u t u r e	Go + verb	3 / 0	2 / 0	0 / 4	13 / 10	2 / 11	3 / 2	6 / 10	6 / 8	5 / 1	2 / 3	0 / 0
	Going to gonna	-‡‡	-	-	-	-	-	-	2 / 3	5 / 0	4 / 3	2 / 1
	Will/'11	-	-	-	-	-	-	-	1 / 5	0 / 1	0 / 3	0 / 5
P a s t	Correct/ M accepts	8# / 5	11 / 5	9 / 5	22 / 5	23 / 4	9 / 3	28 / 12	9 / 5	33 / 9	34 / 10	22 / 4
	Incorrect/ M corrects	19# / 10	13 / 2	18 / 9	14 / 9	21 / 14	8 / 3	23 / 13	24 / 9	25 / 13	15 / 6	3 / 2

‡ = going to/gonna / will/'11 # = N of Eve's productions / N of M's feedback

‡‡ = No spontaneous filial productions

Much of Table 3 is again self-explanatory and the interpretation can be brief. If Eve omits the future morpheme where obligatory, her mother provides predominantly the formal morpheme "will/'11" as feedback. In contrast, when Eve employs either "go" + verb or "going to/gonna" her mother adjusts and is more prone to employ "going to/gonna" to express the future in her feedback. Even more impressive becomes this fine-tuning when Eve begins to employ "will/'11." In 14 out of 15 cases, her mother responds with the same future morpheme. In all these cases, it can be presumed with confidence that the maternal matching serves also as a sign of agreement for Eve, signifying that her attempt was correct.

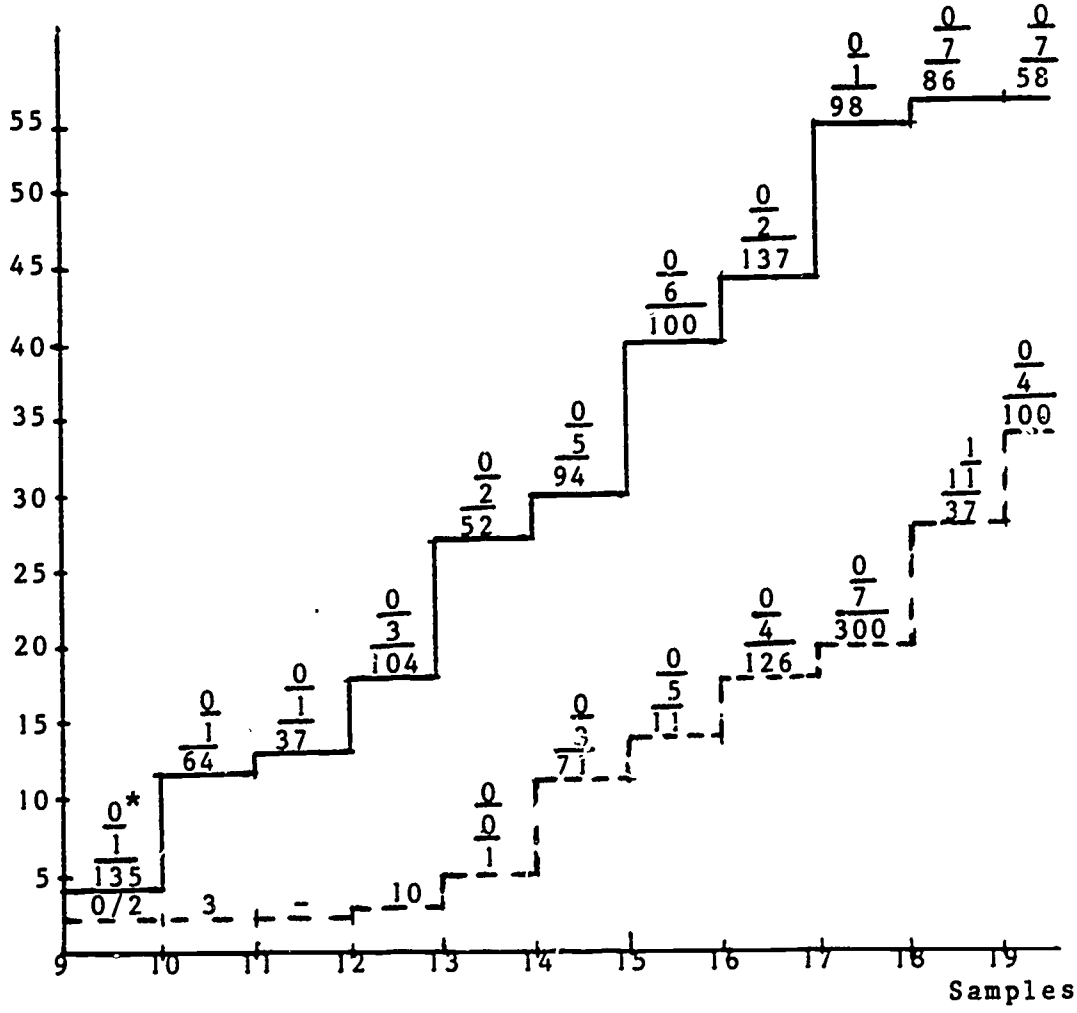
For the past tense, only instances of acceptance, when Eve was correct, vs. correction, when she omitted the obligatory morpheme, are summarized. It can be seen that in the early samples, Eve's correct productions receive confirmatory feedback in around 50 percent of the cases, a high amount of information in the form of intermittent reinforcement. If Eve omits the obligatory morpheme, feedback might be even more important and it is provided in 50 percent or more of the instances in most samples until the end of the recording period. These data suggest that the adult certainly is alert to filial performance and that Eve is quite reliably informed how close she was to the standard or when she deviated from it. This

relational information, provided almost immediately after a filial production, necessarily must contribute to filial learning.

This learning is represented in Figure 1, wherein the number of verbs used in the past and future tense and the factors influencing the productions are given.

Figure 1

Eve's progress from restricted formulas to generalized use of temporal morphemes and her gradual independence from input.



* = $\frac{\text{smallest}}{\text{median}}$ lag between the model/cue and Eve's product
largest

——— = cumulative frequency of verb types employed by Eve in the past tense

– – – = cumulative frequency of verb types employed by Eve in the future sense

The stepwise increase in verb types is obvious, indicating progress from a small number of restricted formulas to generalized use of the morphemes. But broadened use does not necessarily mean productive independence. As the numbers above each step indicate, Eve is prone until the end of the observation period to employ many constructions with a zero lag after a maternal model and even the median interval from a model is quite low until around samples 16 or 17. Close dependency upon a maternal cue is reflected in these numbers. Memory phenomena are obviously involved here: from short-term memory at a lag of zero to assured long-term memory with lags reaching or surpassing 100. Two aspects of productivity are encountered in this table: productivity in the generalization of the morpheme to a large number of verb types and productivity in the sense of becoming independent from a model.

Since previous tables and figures made it appear highly plausible that Eve did not follow a general rule, the question arises which psychological processes support this productivity. Table 4 will provide some first indications to answer this question.

Table 4

Interactional Aspects of Eve's Productions of Temporal Morphemes

	Type	S 9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19
P	Imit.	2/2*	4/6	1/3	2/3	6/9	1/1	4/4	2/2	1/2	4/10	2/9
a												
	Cued	1/4	4/7	2/5	6/11	4/4	4/4	14/17	9/12	15/34	9/19	8/19
s												
t	Spont.	1/1	3/3	1/1	3/4	3/3	2/3	6/8	2/2	6/7	5/6	2/2
	Imit.	2/2	1/1	0	0	2/2	3/3	2/2	3/3	2/2	0	4/5
F												
u												
t	Cued	0	0	0	1/1	1/1	2/2	1/1	2/2	1/1	7/9	5/7
u												
r												
e	Spont.	0	0	0	0	0	1/1	0	3/3	2/2	2/2	3/3

* = Types/Tokens

Eve's productions are broken down in Table 4 into "imitative," "cued," and "spontaneous" ones. "Imitative" productions followed an identical maternal model. "Cued" productions followed a maternal model of the same tense but were produced with a different verb stem. They provide, therefore, indications for pattern analysis and

synthesis. Finally, "spontaneous" productions were formed without preceding maternal scaffolding.

Imitation remains an important factor throughout the recording period, though its proportional frequency declines. Cueing increases strongly in importance and it is the only category involving, at least toward the end, a broad range of verb-types, a fact that suggests pattern-based processes. "Spontaneous" productions remain relatively infrequent, especially in the case of the future, and could easily be based upon rote learning. Microanalyses have shown that they are often based upon fragments from picture books and nursery rhymes. The extremely limited scope of spontaneous productions, especially of the future, argues again against rule-based performance, supporting thereby many indications derived from preceding tables and figures.

Discussion

In a domain where the necessity of learning is obvious, its mechanisms were focused upon. Acoustic and semantic transparency in input leads to first productions. Maternal sensitivity to filial readines results in an increase in the frequency of modeling. Correlations between input variables (frequency and acoustic distinctiveness) and filial use are substantial. Differentiated feedback to filial productions entails four aspects: Fine-tuning, modeling of more advanced forms, confirming, and correcting responses provided in close to 50 percent of the instances. After the child has mastered the rudiments, production deficiency remains a problem. Adults alleviate it through cueing or priming. Whereas imitated productions remain temporally tied to their models, cues lead to production after increasingly longer lags, becoming incrementally more spontaneous with repetitions. With increasing mastery, the range of application expands from restricted formulas to many verb types. A multitude of determiners, such as recency of model/cue, strength of schema, based upon input frequency, or fine-tuning of schemas through affirmation/corrections, leads to probabilistic functioning, as contrasted to deterministic rule-based products.

References

Bolinger, D. (1976). Meaning and memory. Forum Linguisticum, 1, 1-14.

Braine, M. D. S. (1976). Children's first word combinations. Monographs of the Society for Research in Child Development, 41 (1, Serial No. 164).

Bruner, J. (1983). Child's talk. Learning to use language. New York: W. W. Norton.

Bybee, J. L., & Slobin, D. I. (1982). Rules and schemas in the development and use of the English past tense. Language, 58, 265-289.

Cross, T. (1977). Mother's speech adjustments: The contributions of selected child listener variables. In C. E. Snow & C. A. Ferguson (Eds.), Talking to children. Language input and

acquisition. (pp. 151-188). Cambridge: Cambridge Univ. Press.
Demetras, M. J., Post, K. N., & Snow, C. E. (1986). Feedback to first language learners: the role of repetitions and clarification questions. Journal of Child Language, 13, 275-292.
Hirsh-Pasek, K., Treiman, R., & Schneiderman, M. (1984). Brown & Hanlon revisited: mothers' sensitivity to ungrammatical forms. Journal of Child Language, 11, 81-88.
McWhinney, B. (1978). The acquisition of morphophonology. Monographs of the Society for Research in Child Development, 43(1-2, Serial No. 174).
Moerk, E. L. (1972). Principles of dyadic interaction in language learning. Merrill-Palmer Quarterly, 18, 229-257.
Moerk, E. L. (1983). The mother of Eve -- as a first language teacher. Norwood, NJ: Ablex.
Moerk, E. L. (1985). The fuzzy set called "imitations." Paper presented at the biennial meeting of the Society for Research in Child Development, Toronto.
Rumelhart, D. E., & McClelland, J. L. (1985). On learning the past tense of English verbs. (ICS Report 8507). San Diego: University of California. Institute for Cognitive Science.
Shatz, M. (1982). On mechanisms of language acquisition: Can features of the communicative environment account for development? In E. Wanner & L. R. Gleitman (Eds.), Language acquisition: The state of the art. (pp. 102-127). Cambridge: Cambridge Univ. Press.
Snow, C.E. (1972). Mothers' speech to children learning language. Child Development, 43, 549-565.
Snow, C.E. (1977). Mother's speech research: from input to interaction. In C. E. Snow & C.A. Ferguson (Eds.), Talking to children: language input and acquisition. (pp. 31-49). Cambridge: Cambridge Univ. Press.
Snow, C. E. (1983). Saying it again: The role of expanded and deferred imitation in language acquisition. In K. E. Nelson (Ed.), Children's language. Vol. 4. Hillsdale, NJ: Erlbaum.
Vygotsky, L. S. (1978). Mind in society. Cambridge: Harvard Univ. Press.

Acknowledgment

This work was supported by a grant from the Spencer Foundation and by release time provided by California State University, Fresno.

PRCLD 26
1987

PHONOLOGICAL PERCEPTION OF EARLY WORDS

Karen E. Pollock
University of Northern Iowa

Richard G. Schwartz
Purdue University

Recent theories of phonological acquisition (e.g., Macken & Ferguson, 1982; Schwartz & Leonard, 1982; Waterson, 1981) suggest that children play an active role in the construction of a phonological system - extracting and storing information from adult words heard in the environment. Initially, the child is thought to analyze and store whole words or word shapes on an individual (i.e., word-by-word) basis, and not as a sequence of segments or phonemes. These stored forms need not necessarily include all of the characteristics of the adult form. A child might store a form that differs from the adult's production because of an isolated misperception or as the result of a set of perceptual encoding rules. However, in spite of these recent theoretical views, there is little empirical data concerning the perception of meaningful speech during the early stages of language development (e.g., during the period of the first 50 words). Because of the lack of an adequate methodology for studying meaningful perception at this age, developmental phonologists of all theoretical backgrounds have been limited to speculation about the actual nature of children's perception. Such speculations have relied heavily on inferences from phonetic discrimination abilities or production abilities.

Some theorists (e.g., Stampe, 1973) argue that the child's perception of words is adult-like in accuracy, basing this assumption on infants' phonetic discrimination abilities. Infant speech perception studies have shown that even very young infants are capable of discriminating among most of the sounds in their language. However, all of the studies have used non-meaningful stimuli, such as syllables. There are several reasons to question the relationship between these early discrimination abilities and the later perception of meaningful speech. To perceive meaningful stimuli, a child must not only discriminate among the various sounds, but also relate the stimuli to some stored form that is associated with a particular meaning. The greater demands placed on the child in this type of task might cause him to selectively attend to only some of the information available in the signal. The child may ignore other information in the signal, including phonetic discriminations that he was capable of making as an infant. Furthermore, what the child considers to be relevant may differ from what adults consider relevant.

Other developmental phonologists (e.g., Macken, 1980) have attempted to infer perceptual abilities from children's productions. For example, if a child never produces a contrast in his own speech, it is possible that he does not perceive that contrast. However, there are many documented cases of the so-called "fis" phenomenon, where a child fails to make a distinction in his own production, but rejects an adult's production without the distinction (e.g., Berko &

Brown, 1960). Such instances indicate that children's perceptual abilities may not be identical with their production abilities in all cases.

Obviously, neither inferring from infant phonetic discrimination nor inferring from children's production represents an acceptable method for specifying the nature of phonological perception in young children. Unfortunately, there is no empircal data on children's phonological perception during the period in which they are acquiring their first 50 words (i.e., from 12 to 24 months of age). The reason for this lack of data is that there is no available methodology for studying meaningful perception in this age group. Studies of meaningful perception have employed minimal word pairs and paradigms in which children are asked to point to or manipulate a picture or an object (see Barton, 1980, for a review). Such tasks have not been very successful with children under two years of age. In addition, the focus of these studies has been on the discrimination of contrasts between segments or phonemes. Other units of contrast, such as whole words or word shapes, have been ignored. Because many of the recent theoretical proposals suggest that early stored representations are based upon these larger units, there is a need for direct investigation of children's perception of such units.

Some of the paradigms that have been used for testing phonetic discrimination and bimodal perception in infants have the potential for testing phonological perception with slightly older children. One is the visual preference procedure originally used for testing infants' knowledge of auditory and visual relationships (e.g., Spelke, 1978, 1981). Although the task was originally created for testing non-meaningful stimuli, the visual preference procedure has been adapted for testing the comprehension of words in one-year-olds by several investigators (Golinkoff et al., 1987; Thomas et al., 1981). These studies have shown that visual preference paradigms can be used with real word stimuli and with one-year-old children.

In a visual preference procedure, two visual events are shown simultaneously, side-by-side, and one auditory stimulus is presented from a central location. Observers judge when the subjects look to the matching event and to the non-matching event. A higher proportion of time looking towards the matching event is considered evidence that the subject detects the auditory-visual relationship.

The purpose of the present investigation was to further adapt the visual preference procedure to assess meaningful phonological perception in one-year-old children. Previous studies with this procedure in this age range had assessed word comprehension, but had not manipulated any phonological variables. The present paper describes two experiments in which we examined children's recognition of several acoustically distorted variations of familiar words.

Experiment I

Method

Figure 1 shows the experimental setting. The children sat in a high chair in a sound-treated booth facing a projection screen. The parent sat either behind them, or beside them facing away from the

screen. Slides were rear-projected through a window from an adjacent room. The children were videotaped as they watched the slides, and observers scored looks to the left or right slide as they viewed the child on the video monitor. The observers were not aware of the lateral position of the slides or of the auditory stimulus presented. Observer responses were fed into a computer to be timed and compared to an answer key.

Figure 1. Experimental setting

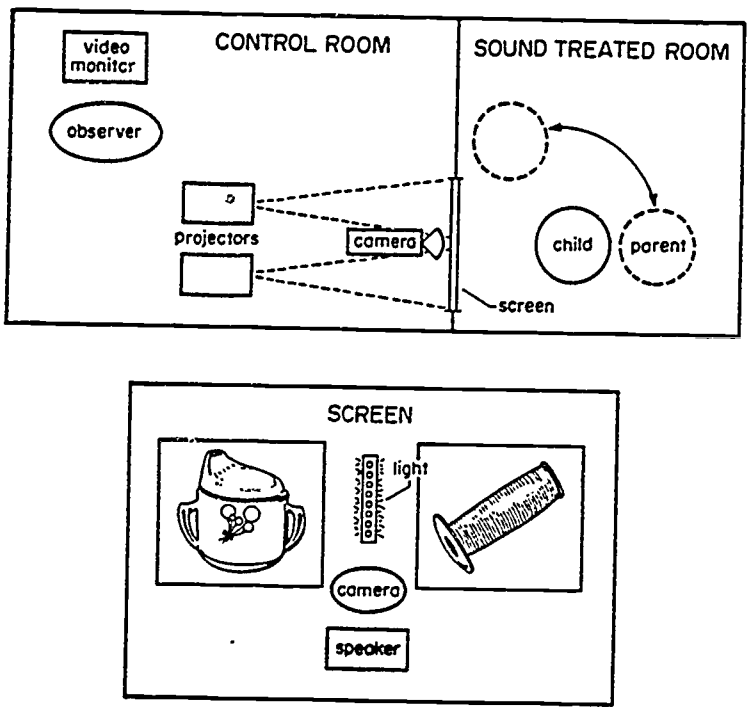


Figure 1 also shows the screen that the children saw. The visual stimuli consisted of color photographic slides of objects representing the experimental words (dogs, books, and cups) and of unusual objects for which they had no label (carrier straps, bicycle grips, and hasps mounted on colored blocks). Several exemplars of each object were used, with slight variation in form and color to help maintain subject attention. In the center of the screen was a strip of red lights used to draw the subjects' attention to midline at the beginning of each trial. The camera and speaker were located in the center of the screen below the slides.

Table 1 shows the auditory stimuli. Three CVC words (dog, book, and cup) were chosen as stimuli because of their common occurrence in the vocabularies of children in this age range, and the ease with which their referent could be represented visually. Six different acoustic forms were created for each word. Form 1 represented the citation form of each word. In Form 2 the final consonant was not released. In Form 3 the final consonant was deleted, and in Form 4 the initial consonant was deleted. In Form 5, the vowel was replaced by another vowel. Form 6 consisted of only the vowel from each word. In addition, one form each of two nonsense words were used as control

stimuli. They did not share any consonants in the same word position as any of the real words, did not contain any of the same vowels, and did not represent error productions of words common in an early vocabulary. The auditory stimuli were created using natural speech that was digitally edited.

Table 1. Phonetic transcriptions of auditory stimuli.

Form	Experimental Words			Control Words	
	dog	book	cup		
1	[dɔg]	[bʊk]	[kʌp]	[gʊt]	[ob]
2	[dɔgˀ]	[bʊkˀ]	[kʌpˀ]		
3	[dɔ]	[bʊ]	[kʌ]		
4	[ɔg]	[ʊk]	[ʌp]		
5	[dæg]	[bɪk]	[kɛp]		
6	[ɔ]	[ʊ]	[ʌ]		

In the first experiment, 12 children from 15 to 20 months of age served as subjects. They passed a screening test of general development, including language, and a hearing screening. They also passed a comprehension pretest with the experimental words (dog, book, and cup) using the same visual preference paradigm that was then used in the experiment. Thus, these children demonstrated knowledge of the words and a tendency for preferential looking before they were selected as subjects.

The subjects in experiment I sat through six experimental sessions lasting approximately four minutes each. Each session contained 26 or 27 trials. In each trial, one slide was an object representing one of the experimental words, and the other was one of the unfamiliar objects. The left-right position of these was counterbalanced and randomized across each session.

The format of each trial was as follows. First, the slides came on and were viewed in silence for 1 3/4 seconds. Then the midline light flashed for half a second, and after a brief delay the word was heard. Following the end of the word, the subjects were given 3 seconds to look at the slides. It was during these 3 seconds that the observer responses were recorded. Each trial was then followed by 2 seconds of blank screen.

Two measures of preferential looking were used. The first involved duration, and is reported as a proportion of time correct (the proportion of time spent looking at the matching slide out of the total time spent looking at any slide). Suppose, for example, that the child saw a dog and a bicycle grip, and heard [dɔ]. If he recognized that form as the word dog, he would look longer at the slide of the dog. If he did not recognize the form, he would either

look at the bicycle grip or look randomly between the two.

The second was a more general measure of the number of looks toward each slide, and is reported as the proportion of correct looks (the proportion of looks to the matching slide out of the total number of looks). Given the same example, if the child recognized [dɔ] as the word dog, he might look more times to the slide of the dog than to the slide of the bicycle grip.

With both measures, the mean proportion correct was compared to .50, or chance, using a one-tailed t-test. We corrected for multiple comparisons by using a stricter criterion of significance, .025.

Results

The results of Experiment I are shown in Table 2. The subjects did look preferentially on some of the forms of the experimental words, but not on the control words. Therefore, they were not simply looking preferentially to the slides of the familiar objects as opposed to unfamiliar objects, regardless of the auditory stimulus. Looking at the proportion of time correct, you will see that the children looked longer at the slide of the dog when they heard [dɔg], [dɔgˀ], [dɔ], or [ɔg], but not when they heard [dæg] or [ɔ]. With the proportion of correct looks, they looked at the dog more times when they heard [dɔgˀ], [dɔ], or [dæg], but not when they heard the other forms. Fewer forms elicited preferential looking with book and cup. It is possible that dog was a more familiar word to these children, and thus they were more tolerant of distorted productions of it. In general, proportion of time correct seemed to be a more sensitive measure than proportion of correct looks.

Looking at the data from Experiment I, a couple of patterns emerge. For example with the word dog, the children seemed to recognize only those forms that contained at least one of the two consonants. With the time measure, the forms recognized also contained the correct vowel. This finding is consistent with theoretical views suggesting that children do not necessarily pay attention to all of the features of the adult production. Looking at all three words, the one form that was recognized in each was the form with the final consonant deleted - [dɔ], [bʊ], and [kʌ]. It is interesting to note that this form is similar to common production patterns for such words in children of this age.

We need to be somewhat cautious in interpreting these group data, given the amount of individual variation found in the different words and the different subjects. In addition, the subjects in Experiment I tired of the task after the first few sessions, and overall the amount of attention they paid to the slides decreased over time. Overall, the proportion of time they spent attending to one or more of the slides averaged 76%.

Experiment II

Method

Because of the problems encountered in maintaining the subjects' attention in Experiment I, a second study was designed using the same stimuli. The task was modified in several ways to increase the

Table 2. Mean proportion of preferential looking.

Word Form	EXPERIMENT I		EXPERIMENT II
	Time Correct	Correct Looks	Time Correct
[dɔg]	.62 *	.56	.58
[dɔgˀ]	.64 *	.60 *	.65 *
[dɔ]	.64 *	.63 *	.56
[ɔg]	.66 *	.55	.68 *
[dæg]	.60	.60 *	.57
[ɔ]	.59	.56	.56
[bʊk]	.60	.48	.45
[bʊkˀ]	.57	.50	.68 *
[bʊ]	.62 *	.49	.53
[ʊk]	.55	.49	.69 *
[bɪk]	.50	.54	.54
[ʊ]	.54	.50	.57
[kʌp]	.60	.49	.51
[kʌpˀ]	.63 *	.57	.56
[kʌ]	.65 *	.60 *	.55
[ʌp]	.49	.55	.61
[kɛp]	.65 *	.62 *	.52
[ʌ]	.60	.50	.52
[gut]	.57	.48	.60
[ob]	.48	.52	.41
* $p < .025$	$t(11) \geq 2.201$		$t(13) \geq 2.160$

overall attention to the stimuli. First, the number of sessions was reduced to four. Each session contained 23 trials. In addition, the length of each individual trial was shortened. The 1 3/4 second silent viewing period was eliminated. The slides came on and the light flashed almost immediately. The responses were still recorded for 3 seconds after the word ended, but the amount of blank screen time between each trial was shortened to only 1 second.

The 14 subjects in Experiment II were 19 and 20 months of age. They also passed a screening of general development and hearing sensitivity. However, they did not participate in the comprehension pretest using the visual preference procedure. It was felt during Experiment I that sitting through the pretest had contributed to the general loss of interest in the task over time. Instead, in Experiment II parental report of word comprehension was accepted. All of the parents reported that their child both comprehended and

produced the three experimental words. The visual and auditory stimuli were the same as those used in Experiment I. However, distribution of the various slide exemplars over the sessions was different. In Experiment I all 8 exemplars had been used in each of the sessions. In Experiment II, some of the exemplars were reserved for later sessions, so that each session the child saw some new exemplars.

Results

The proportion of attention increased in this second experiment, to an average of 95%. Only the proportion of time correct was analyzed in Experiment II. These results are shown in Table 2. The children again looked preferentially on some of the experimental word forms but not on the control words. Preferential looking was demonstrated on only two words, dog and book. On both words, the children looked longer towards the dog or book when they heard the forms with the final consonant not released. Interestingly, they also looked preferentially when they heard forms without the initial consonant - [ɔg] and [ʊk]. This finding might argue against a linear model of template matching, as the presence of the initial consonant did not seem to be critical for word recognition. Rather, these results lend further support to the notion of the word as the unit in young children's phonologies, and suggest again that these children were not attending to all of the information in the word.

Discussion

A great deal of individual variation was observed in these data. This was not unexpected, given the age of the subjects, and what we know about individual variation in children's production at this age.

One way to reduce this variability might be to control more carefully for word familiarity, linguistic level, and phonological production characteristics. Because of the complex procedures involved in creating the auditory stimuli, it was necessary to preselect stimulus words, and then find children who knew these words. As a result, the subjects did not form a homogeneous group in terms of vocabulary size. There are at least two possible solutions to this probelm. One is to select a homogeneous group of children, in terms of vocabulary size and production characteristics, and to train novel words as stimuli. This would also allow us to create minimal pairs to test specific features, including not only phonemic contrasts but also contrasts in larger units. The other is to select a homogeneous group of subjects and to choose stimuli individually for each subject from their production or comprehension vocabularies. This would require individual data analysis for each subject, perhaps using a signal detection analysis or randomization test.

In conclusion, we view the present study as a first step towards empirically testing hypotheses concerning meaningful phonological perception in one-year-old children. The results are consistent with views that children do not perceive words in complete, adult-like forms. Specifically, the children in both experiments responded preferentially to forms of CVC words when they contained one or both

of the correct consonants, but not when both consonants were missing. In addition, for some of the words, the correct vowel was critical for word recognition.

Although there is not necessarily a direct correspondence between a child's perceived form and stored form, these data would suggest that the information these children had represented about each word involved only a few salient features of the adult target. Future investigations might focus more specifically on one or two of these features, to determine the degree of detail actually required for recognition. With continued modifications to remove task-related and individual subject variability, we feel that the visual preference paradigm has potential for finally acquiring some empirical data on phonological perception in young children.

References

Barton, D. (1980). Phonemic perception in children. In G. Yeni-Komshian, J. Kavanagh, and C. Ferguson (Eds.), Child phonology: Volume 2. Perception (pp. 97-116). New York: Academic Press.

Berko, J. & Brown, R. (1960). Psycholinguistic research methods. In P. Mussen (Ed.), Handbook of research methods in child development. New York: Wiley and Sons.

Golinkoff, R.M., Hirsh-Pasek, K., Cauley, K.M., & Gordon, L. (1987). The eyes have it: Lexical and syntactic comprehension in a new paradigm. Journal of Child Language, 14, 23-45.

Macken, M. (1980). The child's lexical representation: The "puzzle-puddle-pickle" evidence. Journal of Linguistics, 16, 1-17.

Macken, M. & Ferguson, C. (1982). Cognitive aspects of phonological development: Model, evidence and issues. In K. Nelson (Ed.), Children's language (Vol. 4). Hillsdale, NJ: Erlbaum.

Schwartz, R.G. & Leonard, L. (1982). Do children pick and choose? An examination of phonological selection and avoidance in early lexical acquisition. Journal of Child Language, 9, 319-336.

Spelke, E. (1978). Intermodal exploration by four-month-old infants: Perception and knowledge of auditory-visual events. Unpublished doctoral dissertation, Cornell University.

Spelke, E. (1981). The infant's acquistion of knowledge of bimodally specified events. Journal of Experimental Child Psychology, 31, 279-299.

Stampe, D. (1973). A dissertation on natural phonology. Unpublished doctoral dissertation, University of Chicago.

Thomas,D., Campos, J., Shucard, D., Ramsay, D. & Shucard, J. (1981). Semantic comprehension in infancy: A signal detection analysis. Child Development, 52, 798-803.

Waterson, N. (1981). A tentative developmental model of phonological representation. In T. Myers, J. Laver, and J. Anderson (Eds.), The cognitive representation of speech. New York: North Holland.

PRCLD 26
1987

The Conceptual Origins of the Transitive / Intransitive Distinction*

Matthew Rispoli
University of California, Berkeley
Lois Bloom
Teachers College, Columbia University

The purpose of this paper is to present evidence that, for the two-year-old child acquiring English, the transitive / intransitive distinction derives from the child's knowledge of action. Antecedents for this proposal are in cognitivist theories of language development, such as the work of Bloom, Miller & Hood (1975) and in the crossiinguistic characterization of children's earliest transitive sentences (Slobin, 1985). Bloom et al. (1975) identified two semantic factors in the relation between nouns and verbs in early sentences: the object affected by the movement named by the verb, and the animacy of the participants in an action. More recently, reviewing data from languages as diverse as Russian, a nominative accusative language, and Kaluli, an ergative-absolutive language, Slobin (1986) has proposed that the surface morphology of transitive sentences reflects the highlights of a manipulative activity scene. These highlights include an ergative type agent, a direct physical action with a clear end-state, and an affected manipulandum. The goal of the present paper is, in part, to extend the hypothesis that surface structures map salient aspects of an action, to the point where we can define conceptual distinctions reflected in the transitive / intransitive action distinction.

The transitive / intransitive distinction is defined here as a difference in sentence frame. Choice of verb, configuration of arguments, case marking and agreement patterns may all be components of a sentence frame. For example, in English action sentences the possibility of a preverbal subject and a postverbal direct object is a component of the transitive sentence frame, while the impossibility of a postverbal direct object is a contrasting component of the intransitive sentence frame. Additionally, the choice of verb is also a component of sentence frame. For example, "fall" cannot appear with a direct object, but "knock over" must appear with a direct object. Thus, sentence frame is a related set of lexical and morphological phenomena.

When we compare two sentences like "Tom opened the door", and "The door opened", the two sentences could be used to refer to the same action. The semantic role of door is identical in both sentences. However, it is a property of the transitive frame that the patient, experiencer, mover, or location is postverbal. In contrast, it is a property of the intransitive frame that the patient, experiencer, mover, or location is in preverbal position. In Lexical Functional Grammar this central thematic role is termed "theme", and is defined by Bresnan (1983, p. 24) as "that argument which undergoes the motion or change in state denoted in the predicate". We shall refer to the conceptual parallel of theme as the locus of change.

The animacy of the locus of change affects the child's conceptualization of an action. By animacy we mean a composite of the volitionality, responsibility and

*The research reported here was supported by a grant from the Spencer Foundation for which we are grateful.

control. Animate loci of change can intend their own change, whereas inanimate loci of change cannot. The child's conceptualization of an action is dependent on how well the child understands the causal relations that exist between the participants of a particular action. The two-year-old child can predict a great many action-outcome sequences. These can become the contents of a child's plans and expectations, which the child may express before they occur. The child may not fully understand the particular causal sequence involved in other actions. Since the child cannot anticipate such actions, the child can only speak about these actions after they occur.

This study tested the following general hypothesis. If, for the two-year-old, the transitive / intransitive distinction functions to signal differences in the conceptualization of actions, we should be able to observe in the child's sentence production, a relation between sentence frame and (1) locus of change animacy, and (2) the child's expectations concerning an action's outcome. Furthermore, if this form-function mapping is part of the grammar of the language, we hypothesize that, the function of the child's sentence frame distinction should resemble the function of the sentence frame distinction in the caregiver language.

Two indicator variables were used to assess locus of change animacy and the child's anticipation of an action's outcome. Since the locus of change maps into the theme argument of an action sentence, theme referent animacy (henceforth theme animacy) was chosen as an indicator of locus of change animacy. Since a child cannot speak about an action prior to its occurrence unless the child has anticipated an action, the temporal difference between the speech-time and the event-time (st/et difference) was chosen as the indicator of the child's anticipation.

The data for this study were taken from fifty-two hours of videotaped mother-child interaction. The sample is comprised of four one-hour-tapes for each of 13 mother-child pairs, representing four consecutive, monthly samples. The four month period spanned each child's transition into multiword speech. The average age of the first month was 22;27, and the average MLU was 1.29. The average age of the last month was 26;04, and the average MLU was 1.95. The mother-child pairs were videotaped interacting in a laboratory-playroom setting. An observer joined the mother-child pair to operate the video camera. Toys were introduced into the playroom at regular intervals. There was a snack in the middle of the session.

Only sentences that were demonstrable examples of transitive or intransitive sentence frames were used. Transitive sentences had a transitive verb and either an explicit subject in preverb position or object in postverb position, or both. Intransitive sentences had an explicit subject in preverb position. Precautions were taken to increase the independence of data points and reduce the effects of adult initiated sentence priming. Imitations of an adult utterance from an immediately prior speaker-turn and self-repetitions from the same or immediately preceding turn were excluded, as were sentences that repeated the same verb used by an adult in the immediately prior turn. All sentences had to be related to a referent action. Therefore, perceptual and mental verbs were excluded. 661 child sentences fulfilled all preconditions of explicitness, independence, and interpretability.

A sample of mother's sentences approximately equal in size to the corpus of child sentences was used to assess caregiver sentences. Each mother contributed approximately 52 sentences. Only sentences addressed to the child were used. Approximately

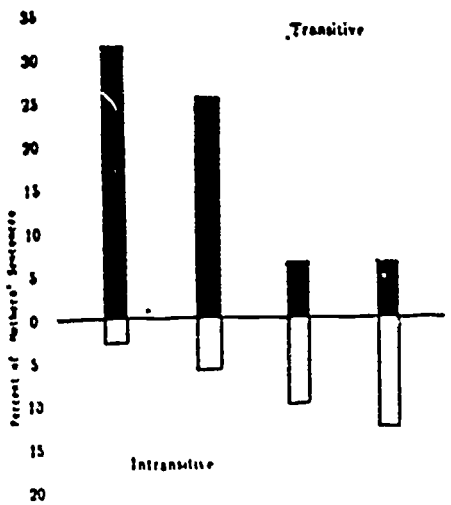
13 sentences were taken from each month's observation. The observations were divided into 15 minute quarters, and sentences were taken from different quarters every month. In order to increase the independence of the data points, echoes of a child's sentence from the immediately prior turn were excluded, as were self-repetitions from the same or prior turn. Since the acquisition of simple sentence frames was the object of this study, only mother's sentences that retained the surface structure of simple sentences were used. In all, 672 mothers' sentences were used in the analysis.

The sentences were coded for theme animacy and the st/et difference. Coding theme animacy entailed first assigning a referent for the theme, whether expressed or implicit. An animacy value was assigned according to the following subclassification: a) true animate, b) animate surrogate (i.e. dolls and pictures of true animates), and c) inanimate. The st/et difference was determined by assigning a definitial event-time to every verb. Definitial assignments took the form of a dictionary, drawn up before the actual coding began so that every instance of a verb was treated consistently. The actual event-time of a sentence was a temporal transition point at which the theme referent underwent the change in state, contacts, location, or orientation denoted by the verb. If the speech-time of a sentence fell before the transition point, the sentence was considered anticipative. Otherwise the speech-time of the sentence was considered non-anticipative. Approximately 10% of the data, 125 sentences (62 children's sentences, 63 adult sentences), were coded independently by the first author and a second reliability coder. The assignment of theme reference to a sentence was a highly reliable, with 99% agreement between coders. There was 94% agreement between coders on the assignment of the st/et difference to a sentence.

First, let us examine the mothers' system. Figure 1 presents the mean percentage of mothers' sentences that were transitive or intransitive across two levels of theme animacy (animate / inanimate) and two levels of the st/et difference (anticipative / non-anticipative) (see the appendix for example sentences). The mothers produced more transitive sentence frames than intransitive sentence frames: 457 transitive sentences, and 215 intransitive sentences. At the inanimate level of theme animacy transitive sentences far outnumbered intransitive sentences (379/60), with a ratio of approximately 6 to 1. At the animate level of theme animacy intransitives were more frequent than transitives (78/155), a ratio of approximately 1 to 2. At the anticipative level of the st/et difference, transitives were more frequent than intransitives (250/89), a ratio of approximately 3 to 1. At the non-anticipative level the difference in frequency between transitives and intransitives was reduced (207/126), a ratio of approximately 1.5 to 1. A two-way, repeated measures ANOVA was performed on the natural logarithms of the ratio of transitive to intransitive sentences (Namboodiri, Carter & Blalock, 1975). There were two bivariate, within subjects, independent variables: theme animacy (animate / inanimate) and the st/et difference (anticipative / non-anticipative). In the mothers' sentences, theme animacy and the st/et difference had their own independent effects on the ratio of transitive to intransitive sentences. The main effect of theme animacy was significant, $F\ (1,12) = 56.33$, $p < .01$. The main effect of the st/et difference was also significant, $F\ (1,12) = 4.97$, $p < .05$. The interaction of theme animacy x st/et difference was not significant, $F\ (1,12) = 4.37$, ns. Both of the non-syntactic factors added together in a linear fashion in their effects on the ratio of transitive to intransitive sentences. Given an inanimate

Figure 1

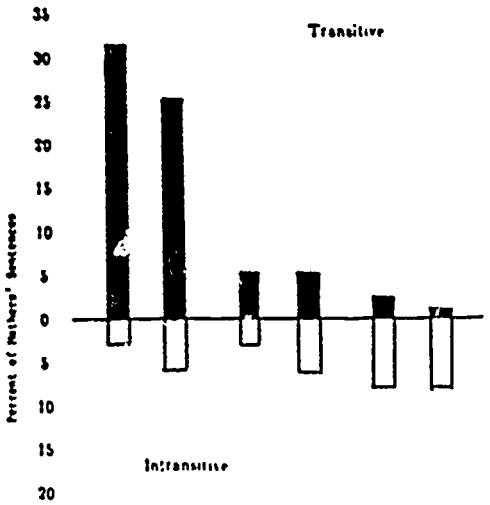
Mean Percentage of Mothers'
Transitive and Intransitive Sentences
Across Theme Animacy and ST/ET Difference



Ant've Non've Ant've Non've
Inanimate Animate
Theme Animacy x ST/ET Difference

Figure 2

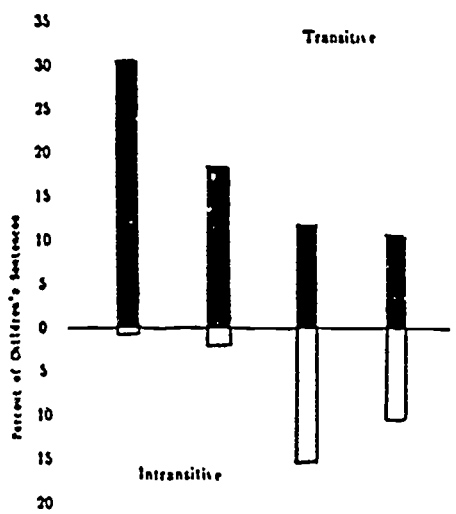
Mean Percentage of Mothers'
Transitive and Intransitive Sentences
Across Theme Animacy and ST/ET Difference



Ant've Non've Ant've Non've Ant've Non've
Inanimate Animate Surrogate Animate
Theme Animacy x ST/ET Difference

Figure 3

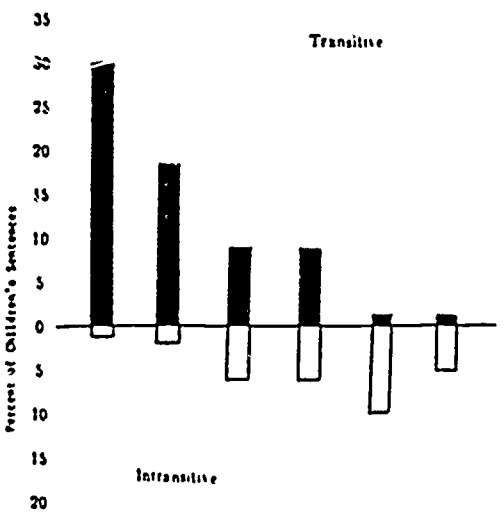
Mean Percentage of Children's
Transitive and Intransitive Sentences
Across Theme Animacy and ST/ET Difference



Ant've Non've Ant've Non've
Inanimate Animate
Theme Animacy x ST/ET Difference

Figure 4

Mean Percentage of Children's
Transitive and Intransitive Sentences
Across Theme Animacy and ST/ET Difference



Ant've Non've Ant've Non've Ant've Non've
Inanimate Animate Surrogate Animate
Theme Animacy x ST/ET Difference

theme referent mothers were far more likely to produce a transitive sentence. Given an animate theme referent mothers were far more likely to produce an intransitive sentence. In addition, intransitives were more likely to be produced if the sentence did not anticipate an action.

The animate level of theme animacy was comprised of animate surrogates and true animates. However, animate surrogate theme referents were treated both as the inanimate objects that they truly are, and as surrogates for animates when in fantasy play. Figure 2 presents the percentage of mothers' sentences that were transitive or intransitive across three levels of theme animacy (true animate, animate surrogate, and inanimate), and two levels of the st/et difference (anticipative, non-anticipative). Most of the so-called animate direct objects were in reality animate surrogates. Only 20 of the 114 sentences with true animate theme referents were transitive. The results indicate that the relationship of sentence frame to the non-syntactic factors was two-dimensional. Both theme animacy and the st/et difference had their own, independent effects on the encoding of arguments in action sentences.

The analysis of the children's sentences paralleled the analysis of mothers' sentences. Figure 3 presents the mean percentage of the children's sentences that were transitive or intransitive across the four non-syntactic conditions (see the appendix for example sentences). As with mothers' sentences, the majority were transitive: 450 transitive sentences, and 211 intransitive sentences. At the inanimate level of theme animacy, there were far more transitives than intransitives (313/32), on average a ratio of approximately 10 to 1. At the animate level of theme animacy intransitives were slightly more frequent (137/179), a ratio of approximately 1 to 1. At both levels of the st/et difference transitives were approximately twice as frequent as intransitives. At the anticipative level there were 267 transitives to 119 intransitives, and at the non-anticipative level there were 183 transitives to 92 intransitives. A two-way repeated measures ANOVA on the natural logarithm of the ratio of transitive to intransitive sentences was performed. The results of the ANOVA showed the main effect of theme animacy to be significant, $F\ (1,12) = 44.30$, $p < .01$. The main effect of the st/et difference did not prove significant, $F\ (1,12) = 2.87$, ns. The interaction effect of theme animacy and the st/et difference proved significant, $F\ (1,12) = 7.02$, $p < .05$. To clarify the source of the interaction an analysis of the simple effects of theme animacy at each level of the st/et difference was performed. The simple effect of theme animacy at the anticipative level was significant, $F\ (1,12) = 101.97$, $p < .01$. The simple effect of theme animacy at the non-anticipative level was also significant, $F\ (1,12) = 12.78$, $p < .01$. From just the enormous differences in F ratios alone, one can see that the relationship between sentence frame and theme animacy was stronger for anticipative sentences than for non-anticipative sentences.

This relationship is further illuminated by a breakdown of theme animacy into three levels: true animate, animate surrogate, and inanimate (Figure 4). The role of the st/et difference is brought into focus when we concentrate on true animate themes and inanimate themes. Given a true animate theme the ratio of transitive to intransitive sentences was approximately 1 to 10 for anticipative sentences, while it was approximately 1 to 5 for non-anticipative sentences. Given an inanimate theme the ratio was approximately 15 to 1 for anticipative sentences, while it was approximately 6 to 1 for non-anticipative sentences. Limiting ourselves to true animate themes and inanimate themes, the correlation between theme animacy the st/et difference was

twice as strong for anticipative sentences as it was for non-anticipative sentences.

We have posited that locus of change animacy is important for the child, because the child is interested in which participants in an action have an intention to act. When the locus of change is inanimate, the child understands that the locus of change does not intend to change. When the locus of change is animate, the child understands that the locus of change may have some, and perhaps all, of the responsibility for the action. When the child plans, desires, or requests an action, the child is focusing on the volitionality of the locus of change. The child does not expect inanimate objects to change by themselves. Neither does the two-year-old child typically plan, request, or desire animates, and in particular persons, to undergo change for which those animates are not responsible.

There are both similarities and differences between the mothers' and children's systems. Let us compare these two systems heuristically, by comparing the pattern of significances from the ANOVAs performed on the mothers' and children's sentences. The major similarity between children's and mothers' systems was in the relationship between theme animacy and sentence frame. Inanimates were primarily seen as undergoers and expressed as direct objects. In constrast animate loci of change were seen as having their own intentions. Within the context of this study animate largely meant human. A social constraint against forcing animates to undergo change may have been operative for both mothers and children. As a result, animate loci of change were seldom expressed as direct objects. The major discrepancy between the mother and child systems was in the role of the st/et difference. In the mothers' system the st/et difference had its own, independent relationship to sentence frame, but the relationship was far weaker than the relationship of sentence frame to theme animacy. The weaker effect was not found in the children's sentences. However, the st/et difference still played a role in the children's system. When the children announced their own intention to act, or requested action, the relationship between sentence frame and theme animacy was stronger than when children had a post-hoc perspective on an action.

We suggest that linguistically relevant conceptualization involves more than just parsing an action into agent and locus of change. It also entails the attribution of responsibility, control, volition and intention to the participants in an action (Bloom & Beckwith, 1987). The less of these attributes a locus of change is seen to have, the more likely it is that the child will encode the locus of change as a patient or undergoer, and in English this generally means direct object. On the other hand, the child is more likely to express volitional and intentional loci of change as intransitive subjects. In some languages this mapping is carried over into the adult grammar. In Archi, a Caucasian language, Achenese, an Austronesian language and Eastern Pomo, an American Indian language, non-volitional, intransitive subjects, are treated by the grammar like direct objects, whereas volitional intransitive subjects are treated as actors (Van Valin, 1987). Thus, in Eastern Pomo the sentences "I get bumped (intentionally)" and "I get bumped (accidentally)" are differentiated by the case marking of the first person singular pronoun. The pronoun for the intentional reading is the ergative agent pronoun, while the pronoun for the accidental reading is the absolutive patient pronoun. As Foley & Van Valin (1984) observe, in languages like Eastern Pomo syntactic relations are isomorphic to an actor / undergoer distinction, and volition is the crucial feature separating these two macro-roles.

For children learning English, the isomorphism may give way when an additional factor, that of temporal perspective on an action, comes into play. When it does, the transitive / intransitive distinction comes to encode more that just an actor / undergoer distinction. In this study we see the hint of a developmental path. In the child system, the transitive / intransitive distinction was strongly related to the volitionality of the locus of change. This relation shows up most distinctly when the child plans, requests, or otherwise anticipates an action. The caregiver system includes the child system, but further adds to it the weaker mapping of temporal deixis to sentence frame.

References

Bloom, L. & Beckwith, R. (1987) Intentionality and language development. Manuscript submitted for publication.

Bloom, L., Miller, P. & Hood, L. (1975) Structure and reduction as aspects of competence in language development. In A. Pick (ed.) Minnesota Symposia on Child Psychology. v.9

Bresnan, J. (1983) The passive in lexical theory. In J. Bresnan (ed.) The mental representation of grammatical relations. Cambridge, Mass., MIT Press.

Foley, W. & Van Valin, R. (1984) Functional syntax and universal grammar. Cambridge: Cambridge University Press.

Namboodiri, N., Carter, L., & Blalock, H. (1975) Applied multivariate analysis and experimental designs. New York: McGraw-Hill.

Slobin, D. (1986) The crosslinguistic evidence for the language-making capacity. In D. Slobin (ed.) The crosslinguistic study of language acquisition. Hillsdale: Erlbaum.

Van Valin, R. (1987) Some implications of Role and Reference Grammar for Language Acquisition. Paper presented at Conference on the Interaction of Form and Function in Language. University of California, Davis.

Appendix: Cross-Classification of Sentences

Mothers' Sentences

1) Transitive, inanimate theme, anticipative:
Wanna put some beads in here? (Charlie's Mom, inviting C to fill a box with beads)

2) Transitive, inanimate theme, non-anticipative:
I'm putting the beads away. (Greta's Mother, as she puts beads into a box)

3) Transitive, animate theme, anticipative:
I'll change you. (Diana's mother before changing D's pampers)

4)Transitive, animate theme, non-anticipative:
You bitin' daddy's feet? (Alvin's Mother, when A had the feet of a father doll in his mouth)

5) Intransitive, inanimate theme, anticipative:
I think it can go under the chair. (Clark's Mother, inviting Clark to move a toy train under a chair)

6) Intransitive, inanimate theme, non-anticipative:
It came out. (Shirley's Mother, after Shirley shook a ball out of a box)

7) Intransitive, animate theme, anticipative:
Robert come down. (Mother, asking Robert to climb down off a chair)

8) Intransitive, animate theme, non-anticipative:
Did you fall? (Vivian's Mother, after Vivian fell off a chair)

Children's Sentences

1) Transitive, inanimate theme, anticipative:
You make a train. (Jessica 29:27, requesting mother to put a toy train together)

2) Transitive, inanimate theme, non-anticipative:
Shake it. (Vivian 19:12, after shaking a closed plastic cup)

3) Transitive, animate theme, anticipative:
Ride pig. (Charlie 25:03, before putting a boy doll on a toy pig)

4) Transitive, animate theme, non-anticipative:
Got it. (Charlie 25:03, after picking up a toy pig)

5) Intransitive, inanimate theme, anticipative:
That door open. (Cory 23:00, before taking the lid off of a plastic cup)

6) Intransitive, inanimate theme, non-anticipative:
Oh blocks falling. (Jessica 29:27, after knocking over a stack of wooden disks)

7) Intransitive, animate theme, anticipative:
I wanna dance. (Alvin 30:09, announcing intention to dance)

8) Intransitive, animate theme, non-anticipative:
Daddy pig come out. (Shirley 19:03, after taking a toy pig out of a truck)

PRCLD 26
1987

PRIVATE SPEECH:
SECOND LANGUAGE LEARNING DURING THE 'SILENT' PERIOD

Muriel Saville-Troike
University of Illinois at Urbana-Champaign

The considerable variation in children's second language learning strategies found in prior research by the writer (Saville-Troike, in press) appears to reflect basic differences in social and cognitive orientation which distinguish two fundamentally different types of learners. I have characterized these basic learner types as "inner-directed" versus "other-directed" (adopting terms from Riesman, 1950). The inner-directed learners approach language learning as an intrapersonal task, with a predominant focus on the language code. These are reflective children, who are ultimately likely to be among the most successful in second language achievement (Saville-Troike, 1984). They typically go through a period during which they do not initiate interaction with speakers of the new language, and largely refrain from overt social verbalization. The fact that the utterances of inner-directed learners in the second language may be relatively complex when they resume communicating clearly indicates there has been no major gap in the process of their linguistic development, but that it has "gone underground", so to speak.

On the basis of the observation that a number of the inner-directed learners frequently talked to themselves during this 'silent' period, it was hypothesized that they were not merely passively assimilating second language input, but were using private speech in an active process of engagement with the input data. Although there has been limited evidence of this process in prior research, which has focused on more readily observable social/interactive speech, I further hypothesized that recordings of naturally occurring private speech might provide a 'window' through which the process could be observed.

In this paper, the subjects and methods used in the present study will be described and the 'silent' period will be situated among the developmental phases of social speech. The nature of the private speech which was recorded will then be discussed. The data presented here are drawn primarily from the private speech of the younger children in the study, concentrating on utterances produced during the 'silent' period. The language learning strategies evidenced in their private speech are then contrasted with those of the older subjects.

The subjects used to test this hypothesis were nine children (3;3 to 8;3), who were native speakers of Chinese, Japanese, or Korean. All of the subjects were of a relatively homogeneous social status, children of foreign graduate students at the University of Illinois, and were enrolled in regular nursery and elementary school classes in the area. Table I lists the nine subjects from youngest to oldest, along with identification of their native language, age in years and months at the beginning of the study, and sex. The column at the right in this table indicates (with the entry "Yes") those children who went

through a 'silent' period of some weeks, during which they engaged in virtually no verbal interaction with English speaking adults or peers and responded to them minimally or not at all. All but S5 had one or more native-language peers in the setting, although these constituted only a small minority in each class. None of the teachers observed was bilingual.

TABLE I
SUBJECTS

Ss	Language	Age	Sex	'Silent' Period
S1	Chinese	3;3	M	Yes
S2	Chinese	4;3	M	Yes
S3	Japanese	5;2	F	Yes
S4	Korean	5;3	M	Yes
S5	Korean	5;4	F	No
S6	Japanese	5;6	M	No
S7	Japanese	5;7	M	Yes
S8	Korean	6;4	F	No
S9	Chinese	8;3	F	Yes

In order to collect data on private speech, we used a wireless radio microphone system (RCA model WM001), with the microphone attached to the child's collar and the receiver plugged in to either a videocamera or an audio cassette recorder. Six of these subjects were videotaped at approximately weekly intervals in English-medium classrooms during the first six months they were exposed to English, beginning with the first week. Three subjects were initially observed without recording and then videotaped weekly beginning after the third week of school, continuing through the fall semester. Recorded sessions lasted from one to three hours each, for a total of 130 hours.

I am proposing that young second language learners go through three phases of social speech in the process of acquiring a second language, labeled here for convenience Phases I - III. During Phase I, some young children who have had no prior experience with speakers of another language continue to address English speakers in their native language, as in the following interactions (1 - 2) between a nursery school teacher [T] and the two Chinese boys in the study, S1 and S2:

1. S1: WODE XIE DAI JIU BA DIAOLE.
   ('My shoelace just came loose.')
   T: OH. YOUR SHOES ARE UNTIED. HERE YOU GO.
2. T: HAVE A STRAWBERRY?
   S2: ZHEIGE YAO BA DIAO CAI KEYI CHI.
   ('This must be taken out before we eat it.')
   T: TAKE THAT PART OUT. PINCH IT OFF.
   S2: ZHEIGE YAO BA DIAO.
   ('This must be taken out.')

The use of two mutually unintelligible languages by interactants who do not comprehend one another is what I have elsewhere termed

"dilingual discourse" (Saville-Troike, 1987). This communicative strategy is often amazingly successful, as the examples illustrate, particularly when topics of conversation are salient in the immediate environment. This native-language/dilingual phase ends for the most part when children recognize that the language they are speaking is different from the one others are using. For children aged five or above, this awareness comes quickly (within two or three days in an English-speaking setting), but it takes longer for younger children. While I have observed the phenomenon with older children, and even adults, no child in this study who was over five years old was recorded using his or her native language with English speakers. It is at this point of metalinguistic awareness that inner-directed children rather abruptly stop initiating verbal social interaction with speakers of the second language and enter the 'silent' period, which intervenes between Phases I and II.

Children are apparently consciously aware of this transition. S2 was interviewed in Chinese during the 9th week of the study, for instance, and asked why he had suddenly stopped speaking Chinese to the English-speaking nursery school teachers and children. He responded that he knew they spoke a different language and weren't going to learn Chinese. He reported to us that he was learning English, and was going to speak that thereafter. S3 was also interviewed at this point (for her, during the 4th week -- in Japanese), and she said that there was this "English" that people were using and it was too hard, so she had stopped talking to them.

At the start of Phase II, children who have gone through a 'silent' period again initiate verbal interaction with English speakers, but do so only with single words (usually names of objects), memorized routines, or by repeating after other children, as in examples (3) through (5):

3. S5: BATHROOM. (i.e. 'I want to go to the bathroom.')
4. S4: I'M DONE.
5. Child: OK. ALL DONE.
   T: YOU'RE ALL DONE?
   S2: OK. ALL DONE.
   T: YOU'RE ALL DONE TOO?

The rehearsal function of private speech is most clearly evident at this point. When reflective children begin initiating speech in English, they commonly first practice to themselves what they want to say before saying it aloud. This is illustrated in (6) through (9) for S2, S4, and S7. In example (9), for instance, S7 responded privately to the teacher's daily question about the weather for at least a week before he raised his hand and first volunteered an answer. When he finally did, his voice was loud and self-assured.

6. (Children told to draw something they do on a sunny day)
   S2 to Self: SUNNY.
   S2 to T: SUNNY. (Points to his picture)
7. (Children told to find pictures of food items)
   S4 to Self: SEVEN-UP. SEVEN-UP.
   S4 to T: MRS. BARNES? SEVEN-UP.

8. S7 to Self: TRIANGLE, PLEASE. TRIANGLE.
   T to S7: YOSHI, WHAT SHAPE DO YOU WANT?
   S7 to T: TRIANGLE.
9. T to Class: CAN ANYONE TELL US ABOUT THE WEATHER?
   S7 to T: COLD.

Phase III begins when children start generating novel utterances with the English words they have acquired. These are most easily recognizable for their ungrammaticality, as in examples (10) through (12):

10. S2: MY IT'S WRONG.
11. S5: I WANT TO THERE.
12. S7: THIS IS HATS FIRE.

Table II summarizes these phases of second language development. The numbers under each phase of social speech (headed by I, II, III) and the 'silent' period (between phases I and II) represent the weeks when each of the subjects exhibited characteristics of that period, if they did so within the time frame of the study.

TABLE II
PHASES OF SECOND LANGUAGE DEVELOPMENT

Ss	Phase I	Silent	Phase II	Phase III
S1	1-11	12-23	24+	--
S2	1-8	9-14	15-17	18+
S3	1-3	4+	--	--
S4	--	1-10	11+	--
S5	1	--	1	2+
S6	--	--	1	2+
S7	1	1-8	9-10	11+
S8	--	--	1	2+
S9	--	1-5	6-9	10+

As defined on the basis of this study, the 'silent' period is not necessarily one of categorical silence, but its onset is marked by a dramatic drop in language directed to speakers of the second language. This is not to say that the children actually withdraw from social engagement, since all of the 'silent' subjects continued to interact at least nonverbally with English speakers (and verbally with their native-language peers). However, as indicated previously, during this period the children were seldom if ever found to initiate a verbal exchange with an English speaker, though some were willing at times to respond minimally to a direct question (usually with "yes" or "no"), or to identify or repeat the name of an object if an adult explicitly directed them to do so.

S1 and S4, for example, virtually refused to speak at all to English-speaking adults or children for several weeks; they responded to questions only by nodding or shaking their heads, or by turning away from whoever addressed them. S3's behavior with her kindergarten teacher was similar, and she even turned her back on the teacher when attention was demanded. She did vocalize with English-speaking peers, but made little use of language after she gave up on using Japanese with them. The following exchange (13) is an illustration of the type

of pseudo-conversation she engaged in:

13. S3: GIUK GIUK. GIUK.
GIUK GIUK GIUK. GIUK GIUK GIUK. GIUK GIUK GIUK.
GIUK GIUK GIUK. GIUK GIUK GIUK. GIUK GIUK GIUK.
ONE, TWO, THREE.
Child: HUP, TWO, THREE, FOUR.
S3: WHACKO WHACKO WHACKO UM. WHACKO WHACKO WHACKO UM.
WHACKO.

The other 'silent' children continued to respond to teachers' questions at least some of the time during this period, and to repeat words or phrases when they were directed to, but their verbalization was highly restricted. To illustrate the relative drop in production this represents, Table III contrasts the number of utterances, total number of words (i.e., tokens), and number of different English words that S2 directed to English speakers during Phase I versus the 'silent' period (excluding utterances which consisted only of the names of letters or numbers).

TABLE III
S2'S PRODUCTION TO ENGLISH SPEAKERS

Phase:	I	'Silent'				II	
Week Number:	6	9	11	12	13	15	17
Utterances:	238	33	35	43	18	67	74
Total words:	1,180*	46	51**	49	26	116	144
Dif. L2 words:	17	17	12	6	13	30	45

*1,126 Chinese words
**16 Chinese words

Each of the nursery school sessions lasted for three hours. In the 6th week S2's total production of 1,180 words included 54 in English, while of the other weeks listed, only one exchange with English speakers (during the 11th week) contained any Chinese. In the 12th week figures, the total of 49 words spoken involved only 6 different lexical items, and included 32 occurrences of "no" and 8 of "yes" (65.3% and 16.4%, respectively, of the total).

The following dilingual exchange (14) occurred in the 11th week. It provides evidence of the frustration children may face as they recognize their linguistic limitations, and suggests one possible motivation for the lapse in social speech.

14. S2: WOMEN YAO TAO MING YINWEI YOU YIZHI KOU ZHUI WOMEN.
('We must flee for our life because there was a dog chasing us.')
T: WHAT? I DIDN'T HEAR YOU.
S2: YINGWEN.
('English.')
DARG.
DOG.
T: HUH? WHAT?
S2: DOG.
T: WHAT?

S2 made this one last attempt to communicate with an English speaker in Chinese in his excitement over an imaginary chase. He then switched to English, and was restricted to trying to express himself with a single word, "dog". Because of his deviant pronunciation, the teacher did not even comprehend that. It was four more weeks before he again tried to initiate an exchange with an English speaker.

Immediate repetition of something said by another was common in the private speech of subjects of all ages, but differences in what was selected for repetition indicates differences in their scope and focus of attention. The youngest children generally adhered to the principle of paying attention to the word or phrase at the end of an utterance (Slobin, 1973), including the final intonation contour. Three year old S1 was limited to repeating only the last word of whatever was said, as in (15) and (16), while four year old S2 often repeated phrases or complete sentences, as in (17) and (18).

15. Child: I WANT YOU TO RIDE THE BIKE.
    S1: BIKE.
16. T: I NEED YOU TO WALK?
    S1: WALK? WALK? WALK? WALK?
17. T: YOU NEED TO BE DOWN HERE AND WAITING TOO.
    S2: WAITING TOO.
18. T: WHAT'S HAPPENED THERE.
    S2: WHAT'S HAPPENED THERE.

Example (19) is particularly interesting, since S2 was playing with his back to three other children, and repeated quietly to himself what each of them said in turn.

19. Child 1: POOTY.
    S2: POOTY.
    Child 2: POOTY?
    S2: POOTY?
    Child 3: HEY, LOOK.
    S2: HEY, LOOK.
    Child 2: WHAT ARE YOU DOING?
    S2: WHAT ARE YOU DOING?

S2 also repeated medial phrases if they occurred before prepositional or conjoined phrases, as in (20) and (21), and he sometimes repeated stressed words from a sentence in a type of telegraphic speech, as in (22).

20. T: TAKE ONE SCOOT TOWARD ME.
    S2: ONE SCOOT.
21. T: DO YOU THINK YOU COULD STAND UP AND PRETEND YOU'RE A CHOIR?
    S2: STAND UP.
22. Child: IT PUTS THAT THING AND RIP IT OUT.
    S2: PUT OUT THING. PUT OUT.

Older children were more likely to repeat the topic of a sentence, as in (23), or to repeat words or phrases which were most salient to the point of a lesson. Example (24) was uttered during a lesson on color terms, for instance.

23. T: SQUIRRELS LIKE TO EAT THESE, DON'T THEY?
    S7: QUIRRL.

24. T: TAKE OUT THE PINK CARDS.
S9: PINK.

Use of English words by S1 and S2 began before they entered the 'silent' period, while they were still speaking Chinese to English speaking teachers and peers, in the form of incorporating a few English words (e.g., "Macdonalds", "cheeseburger", "stop sign") in their Chinese utterances. There is evidence, however, that actual repetition did not begin until they became consciously aware that others around them were speaking a different language. For S2, the moment of awareness serendipitously occurred on a day he was being videotaped. He was playing near the teacher, who was talking to another child. S2 suddenly looked quite startled and broke into their conversation, as represented in (25).

25. T to Child: PATRICK, DO YOU LIKE THE BIKE WITH THE RED SEAT BETTER THAN THE BIKE WITH THE WOODEN SEAT?
S2 to T: NI DZAI SHUO SHENME A?
('What are you saying?')
NI DZAI DZUO SHENME?
('What are you doing?')

This event took place during the fourth week of his exposure to English; there is no instance of S2 repeating words either aloud or to himself during the 9 hours, 24 minutes of recording which precedes it, but he began repeating English words to himself immediately thereafter and continued to do so for the remainder of the study.

That speaking English was an intentional and meaningful act for S2 is further illustrated in (26), which occurred later on the same day. Right after saying "stop sign" to himself, he reported it as news to the teacher.

26. S2 to T: WO GANG GANG SHUO "STOP SIGN".
('I just now said "stop sign".')

It is also notable, however, that although four-year-old S2 recognized at this point the existence of a different language, it would be several more weeks before he appeared to realize that those who spoke that language could not understand Chinese. That realization would mark the beginning of his silence.

Even the youngest children in this sample were clearly comprehending the denotational meaning of much of what they attended to. Evidence for this is found in their recall of English words and phrases in relation to appropriate objects, actions, or situations, as in (27) through (29).

27. S1: (Finished using bathroom) I DONE.
28. S1: (Jumping on mattress) UP AND DOWN.
29. S2: (Opens door and goes in storage room)
OPEN. DARK.
IN THE DARK, DARK, DARK. IN THE DARK.

Also, they frequently integrated English words or phrases into longer meaningful sequences, as in (30) and (31). In these dual-language examples, the words in upper case letters were uttered in English, while those in lower case are glosses of what was said in the native language.

30. Child: COOKIE.
S1: COOKIE.
Put a COOKIE inside.
31. S2: (Driving around on tricycle)
Go to SKYSCRAPER CHICAGO.

Example (32) shows that S1 incorporated English words even when he knew the lexical item in Chinese, and his dual-language pairings suggest he was equating their meaning. There is also evidence for his consciousness of the meaning of English terms in questions that he asked himself in Chinese, such as (33).

32. S1: (Watching another child who is crying)
LOOK? LET'S STOP? STOP? STOP? STOP? STOP?
Stop.
STOP?
Don't cry.
33. T: WOULD YOU LIKE MORE PEANUTS?
S1: PEANUTS? That's peanuts?

S2 also asked reflective questions, as in (34). He often provided an explicit translation to himself, or in social speech to S1 or to Eva (another Chinese-speaking child) as he taught them English words he had learned, as in (35) and (36).

34. Child: THIS IS TOO BIG. (Referring to a peg)
S2: Is this big? (Referring to a peg he has)
35. S2: AIRPLANE SKY. (Points at airplane overhead)
S2 to S1: Look. Airplane.
There is an airplane in the sky.
36. S2 to S1: EXIT is exit. This is called exit.

S2 apparently recognized when he did or did not understand what someone else said, as (37) and (38) indicate.

37. T: JUST A MINUTE.
S2 to Eva: How come she said wait a moment?
38. S2: His English is too difficult for me.

Meaningful recall in the absence of immediate auditory stimuli was often triggered by familiar objects and events they re-experienced, and aided by the children's developing scripts for what an English speaker was likely to say within a sequence of events. For instance, S1 often said "Clean up time" after a block of time had been spent in a single activity, and S2 said "Good job" when he washed his hands after using the toilet alone (which is how the teacher evaluated that act when she was in the bathroom with him).

In spite of the fact S1 and S2 attended to meaning, however, meaningfulness was not a necessary condition for repetition and recall. Both boys were skilled in constructing imaginative private narratives in a combination of Chinese and English which made little referential sense, as in (39) through (41).

39. S1: This is A D PIVE. This is big X, Z, X, Y.
(Digging in dirt; no letters or numbers visible)
40. S1: DARK. ONE OUNCE. ONE OUNCE.
ELEVEN OUNCE. THREE OUNCE. ONE ONE OUNCE.
Hasn't come out yet.
TWO OUNCE. TWO OUNCE.

ONE OUNCE hasn't come out yet. Then come out.
ONE OUNCE. ONE OUNCE. ONE OUNCE. ONE OUNCE.

41. S2: The middle part is the NO PARKING zone.
Then he wrote B, L, M, O, P.
BATHROOM. Being turned over.
THE END.

Most of the time, in fact, recall for S1 and S2 occurred quite apart from any visible or audible stimulus. Usually they recalled words and phrases for which they knew the meaning, but this was not always the case. Examples (42) through (45) all illustrate this phenomenon. Both children were repeating function words many weeks before there was any indication they could understand or use them appropriately, and they produced many utterances they probably could not comprehend, such as the "Are you awesome?" and "Hell, hell, hell" said by S2. These can only be interpreted as unanalyzed quotations of what they had heard said by someone else.

42. S1: WHAT. (Climbing stairs)
43. S2: WHOSE.
BABE. HI, BABE.
44. S2: UP. UP. UP? HOW DOES. HOW.
D, G, F. HOW.
45. S2: DON'T BOTHER ME. (2x)
YUCKY.
DON'T BOTHER ME. (3x)

The youngest children's production of words and phrases which had no denotational meaning for them must clearly be assigned to the lowest level in the hierarchy of private speech functions, i.e., that of repetition for its own sake. At the same time, however, their recall of English in private speech apart from visible stimuli (whether meaningful to them or not) demonstrates the children's capacity for focusing their attention on the second language in the absence of either perceptual or social/interactional support for doing so (cf. Flavell et al, 1966, for a report of the same competence attributed only to older children).

Just as with young children in the course of first language development (cf. Sanches & Kirshenblatt-Gimblett, 1976), S1 and S2 focused extensively on the sounds of the second language, and seemed to relate to the kinesthetics of pronouncing certain words. High frequency private vocabulary for them included "butter pecan", "parking lot", "skyscraper", and "cookie monster". Both children also demonstrated their attention to sound by creating new words with English phonological structure, including "otraberver", "goch", "treer", and "trumble" — impossible sequences in their native Mandarin Chinese. The focus on sounds not infrequently led to play, as the boys chanted rhythmically or intoned words to themselves (e.g., examples 46 and 47).

46. S1: JELLY BEAN, JELLY BEAN.
JELLY, JELLY, JELLY, JELLY.
47. S2: YUCKY. YUCKY SCOOP.
SCOOP SCOOP YUCKY SCOOP.
YUCKY YUCKY YUCK-YUCKY.

The older inner-directed learners all sang parts of songs to themselves, like the "ABC Song" or "Happy Birthday to You", but none created play with English language sounds. Interestingly, the more socially-oriented five and six year old children were more like the younger children in this respect. When those who did not go through a 'silent' period used English to themselves, it was often meaningless sound play, as in (48) and (49).

48. S6: HESIN KEESIN MOOPEE.
POOKEE KEESIN KEESIN.
KUPEE HEESIN HE THINK.
CANNOT CANNOT KNOCK.

49. S8: MY ICE CREAM.
O-O-O-O.
O-O-O NO.
NO NO NO NO NO.

We thus find a major contrast in degree of focus on language sound both by age and by learning style. In contrast to the older inner-directed learners, older other-directed learners, to the extent they used private speech at all, rather atavistically engaged primarily in sound play, a characteristic of the younger inner-directed second language learners and of younger first language learners generally.

While language form was clearly not as salient for the youngest children as was sound, it is noteworthy that they did attend to it, at least to some extent. S2's awareness of English morphology is indicated in such chants as (50) and (51), for instance, where he varied word endings, and (52) and (53), which illustrate his manipulation of compound forms.

50. S2: WALKING, WALKING, WALK. WALKING, WALKING, WALK.
(Chanted while walking)

51. S2: QUICK. QUICK, QUICK. QUICKLY. QUICK.

52. S2: BATHROOM. BATH.

53. T: LET'S GO OUTSIDE.
S2: OUT. OUTSIDE.

Both S1 and S2 appeared to be quite serious and intentional in this recall or repetition at times, as they recited substitution patterns, as in (54) and (55).

54. S1: UP. GO.
GO UP, GO DOWN.
GO DOWN, GO UP.
GO UP, GO DOWN.

55. T: YOU GUYS GO BRUSH YOUR TEETH.
AND WIPE YOUR HANDS ON THE TOWEL.
S2: WIPE YOUR HAND. WIPE YOUR TEETH.

S2 also frequently created self-expansions (primarily with reduplication), as in (56) and (57).

56. S2: WHAT'S WRONG. WHAT WHAT'S WHAT'S WRONG.

57. S2: BIG ROAD. THE BIG ROAD.
BIG BIG BIG BIG BIG ROAD ROAD.

At a time when he was still maintaining silence with English speakers, or responding to them in no more than one or two words, S2 was already

constructing unique sentences like (58) and (59) in his private speech. His ability to produce English was clearly well ahead of his overt social production.

58. S2: MINE IS LET'S GO. (i.e. 'I will leave')
59. S2: MY IT'S GO HOUSE IN.
(i.e. 'I am going into the house')

In contrast, even when S1 resumed social speech near the end of the six months under study, he was still limited to memorized routines, or to substitutions in a frame provided by others, as in (60). In the developmental scheme proposed here, he had only reached Phase II.

60. Child to S1: HOW OLD ARE YOU?
S1 to Child: THREE OLD ARE YOU.

The older children in this sample whom I have identified as reflective, or inner-directed in their learning style, all appeared to focus on second language form, as well as on meaning. This was evidenced most clearly in private pattern drills, such as those in (61) and (62) which were uttered by five-year-old S7. In (61), he was practicing English auxiliaries; his paradigm indicates he had correctly assigned have and am to the same syntactic slot, and recognized the contraction as equivalent. Example (62) represents a "build-up" drill, where S7 practiced adding an object to his predication.

61. S7: I FINISHED.
I HAVE FINISHED.
I AM FINISHED.
I'M FINISHED.
62. S7: I WANT.
I PAPER. PAPER. PAPER.
I WANT PAPER.

Not surprisingly, children were most likely to focus on form when the task they were involved in was directly related to language learning per se. For instance, example (63) illustrates a pattern eight-year-old S9 commonly produced while writing sentences in her language workbook. She first constructed the parts to herself, then named letters as she wrote, and finally repeated the result.

63. S9: I SEE A, ELEPHANT.
E, L, E, P, H, A, N, T.
I SEE A ELEPHANT.
I SEE A ELEPHANT NOSE?
IS IN THE, WATER.
W?
A, T, E, R.
WATER.

It is significant, however, that when S9 worked in her math workbook or commented on other happenings, her private speech was not in English at all, but in Chinese.

Attention to linguistic form requires a relatively high level of cognitive processing from children, including abstraction of form from its meaning to some extent, and recognition of paradigmatic and syntagmatic relationships. It is at this level that private speech appears to be most consciously employed by inner-directed learners as

a tool used in constructing a second language.

Follow-up recordings of three of the children who remained in the United States for school the next year have shown that degree of bilingualism (i.e., relative proficiency in the two languages) may affect the choice of language in private speech. The most extensive information is available on S2, whom we continued to videotape throughout kindergarten (cf. Chen, 1987). By the end of the second year, English was being used for over 75% of his private speech. Because of the short length of time most of the subjects remained in this country, it is not possible to draw conclusions about the relationship of the 'silent' period and its attendant learning strategies to long-range second language development. Further longitudinal research will be needed on this issue.

Perhaps even more important for future research is the finding of different constellations of learning strategies and behaviors making up two distinct learning styles, here labeled "inner-directed" (or reflective) and "other-directed" (or socially-oriented), and the significant differences in quantity and quality of private speech use for second language acquisition by these two types of learners. While the full range of learning strategies is probably available to all children of this age range, pervasive personality factors (e.g., cautious versus risk-taking) and cultural differences in socialization practices may lead to one style of learning being preferred by certain individuals or sociocultural groups. Clearly these differences cannot be ignored if learning processes in children -- and particularly among children from different cultural and linguistic backgrounds -- are to be fully understood.

References

Chen, R-M. The private speech of a Chinese-English bilingual child: A naturalistic longitudinal study. (Doctoral dissertation, University of Illinois at Urbana-Champaign, 1987.)

Flavell, J. H., Beach, D. R., & Chinsky, J. M. Spontaneous verbal rehearsal in a memory task as a function of age. Child Development, 1966, 37, 238-299.

Reisman, D. The lonely crowd. New Haven, CN: Yale University Press, 1950.

Sanches, M., & Kirshenblatt-Gimblett, B. Children's traditional play and child language. In B. Kirshenblatt-Gimblett (Ed.), Speech play. Philadelphia, PA: University of Pennsylvania Press, 1976.

Saville-Troike, M. What really matters in second language learning for academic achievement? TESOL Quarterly, 1984, 17, 199-219.

Saville-Troike, M. Dilingual discourse: Communication without a common language. Linguistics, 1987, 25, 81-106.

Saville-Troike, M. From context to communication: Paths to second language acquisition. In D. Tannen (Ed.), Discourse theory and application. Norwood, NJ: Ablex, in press.

Slobin, D. I. Cognitive prerequisites for the development of grammar. In C. A. Ferguson & D. I. Slobin (Eds.), Studies of child language development. New York: Holt, Rinehart, and Winston, 1973.

PRCLD 26
1987

Morphological Innovation in the Acquisition of American Sign Language

Karen van Hoek, Lucinda O'Grady, and Ursula Bellugi
The Salk Institute for Biological Studies, La Jolla, CA

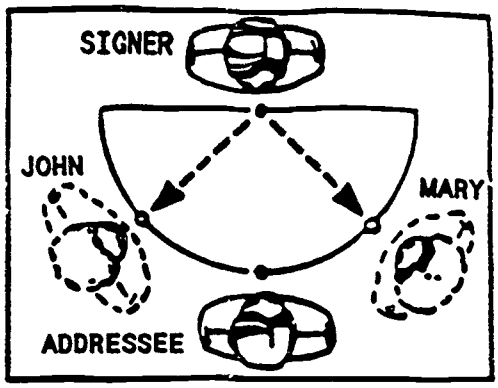
American Sign Language is the visual-gestural language used by deaf people in the United States and parts of Canada. It is acquired as a native language by deaf children of deaf parents. More than a decade of research has shown that, in general, the milestones of language acquisition are reached at the same points in the maturational timetable for deaf children acquiring ASL as for hearing children learning a spoken language of the same general morpho-syntactic type (see Newport and Meier (1986) and references there).

The syntax of ASL crucially makes use of the spatial medium in which the language has developed. Nominals are associated with arbitrary points (referential loci) in the signing space, and verb signs show agreement with their arguments by moving between these loci. Among the mechanisms that associate a nominal with a locus is indexing: the nominal is followed by a point to an arbitrarily-selected locus in the signing space. For example, the sequence JOHN INDEX_a, MARY INDEX_b establishes John and Mary at loci a and b, respectively (see figure 1a). $_a\text{GIVE}_b$, with movement between loci a and b, means 'John gives Mary'; $_b\text{GIVE}_a$ means 'Mary gives John' (see Meier (1982) for a full description of notation).

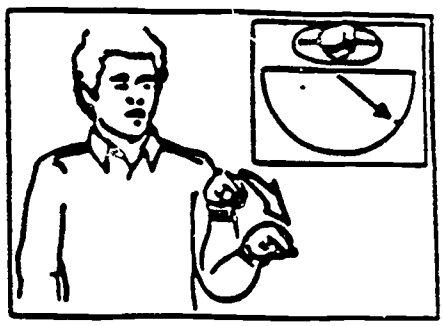
We refer to the system described above as the Fixed Referential System, because the loci for referents, once established, remain relatively constant throughout a stretch of discourse. It is possible, however, to shift this referential frame, so that loci are reassociated with new referents. This shift is signaled through a change in posture or eyegaze. Under the Shifted Reference System, verb agreement or pronominal signs directed to or from the signer's locus have third-person, rather than first person, reference. (Figure 1b)

Our lab has been researching the development of syntax, discourse and narrative in deaf children of deaf parents, who are acquiring ASL as a native language. The data presented here come entirely from narratives by deaf children of deaf parents, between the ages of two and eight. The narratives were collected from a total of 24 children, and are part of our larger study of the acquisition of spatialized morphology and syntax.

The narratives were elicited with the use of specialized story books, containing pictures but no words. Each child was asked to look at the story book, page by page, and describe what was happening in each picture. Then the book was taken away, and the child was asked to tell the entire story again. The data in this paper are from the children's narratives done without the book. The storybook we used showed a boy and a girl sitting at a table, painting pictures. The boy slaps paint on the girl's face, and then the girl slaps paint on the boy's face. The boy pours a cup of water on the

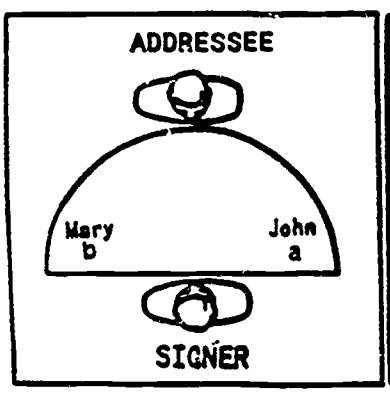


INDEX$_a$ 'JOHN'

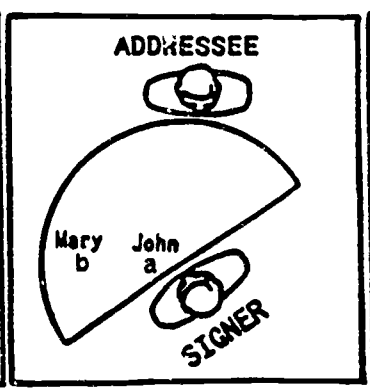


INDEX$_b$ 'Mary'

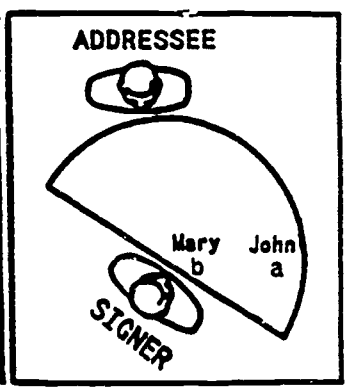
a) Nominal Establishment



FIXED FRAMEWORK



1/a SHIFT



1/b SHIFT

b) Fixed and Shifting Referential Framework

Figure 1. Aspects of Spatialized Syntax in ASL

girl's head, and the girl then pours water on the boy's head. Their mother, who has had her back to them throughout the sequence, now sees what they are doing and scolds them. The storybook is used to elicit a number of things, including a particular class of verbs which present an interesting test of the child's developing mastery of the spatialized syntax of ASL.

Surprisingly, in examining the children's use of these verbs, we found morphological forms which do not appear in the adult grammar at all, yet which were widespread in the children's signing. Of the 24 children from whom we have elicited stories, eight used these novel forms (described below). This phenomenon is of interest for the insight it can give us into the sorts of hypotheses that deaf children acquiring ASL develop as they acquire the spatialized underpinnings of the grammar, and as they integrate them into a coherent system. Completely novel forms may also provide an opportunity to see underlying principles of the grammar instantiated in ways which are never seen in the adult language; it may be that the children have not yet acquired the additional principles which rule these forms out.

We will first present the narrative as an adult might do it, contrasting that with the way many of the children generally signed it. We will then proceed to the novel verb forms which we have found, and explain how and why they differ from any existing morphological forms in adult ASL.

For an adult signer, the narrative might begin with an ASL sentence conveying the idea that a boy and a girl were playing with paints. In adult ASL, this would involve establishing loci for each of the characters, by signing e.g., BOY INDEX-a, GIRL INDEX-b. This might well be followed by a two-sentence string such as: BOY $_{a}$PAINT$_{b}$ GIRL, PAINT-FACE[1/b shift] // GIRL $_{b}$PAINT$_{a}$ BOY, PAINT-FACE[1/a shift]. (The first sentence is illustrated in figure 2a). Note the spatial reference shift on the sign PAINT-FACE in each sentence. Many of the children at or below age 5 described this situation with such sentences as: *BOY PAINT-FACE GIRL // *GIRL PAINT-FACE BOY. The reasons for the unacceptability of these constructions will be discussed shortly.

In an adult version, the story might well continue as follows: WATER, BOY $_{a}$POUR$_{b}$ GIRL, SPILL-OVER-HEAD[1/b shift] // GIRL $_{b}$POUR$_{a}$ BOY, SPILL-OVER-HEAD[1/a shift]. Note again the use of referential shift, with the sign SPILL-OVER-HEAD. Many of the children in our study, up to approximately age 5, signed the sequence as: *BOY POUR-ON-HEAD SPILL-OVER-HEAD GIRL // *GIRL POUR-ON-HEAD SPILL-OVER-HEAD BOY. Again, this is incorrect from the point of view of the adult grammar.

One clear difference between the adult and child versions of the story is that, while the adult version includes spatial agreement morphology on the verbs PAINT and POUR, the children's narratives were almost entirely lacking in this sort of spatial morphology. Surprisingly, many of the children nevertheless used spatial distinctions in the forms of verbs to contrast between the two referents--distinctions in form quite different from those used by adults. In describing the boy painting the girl's face, several of

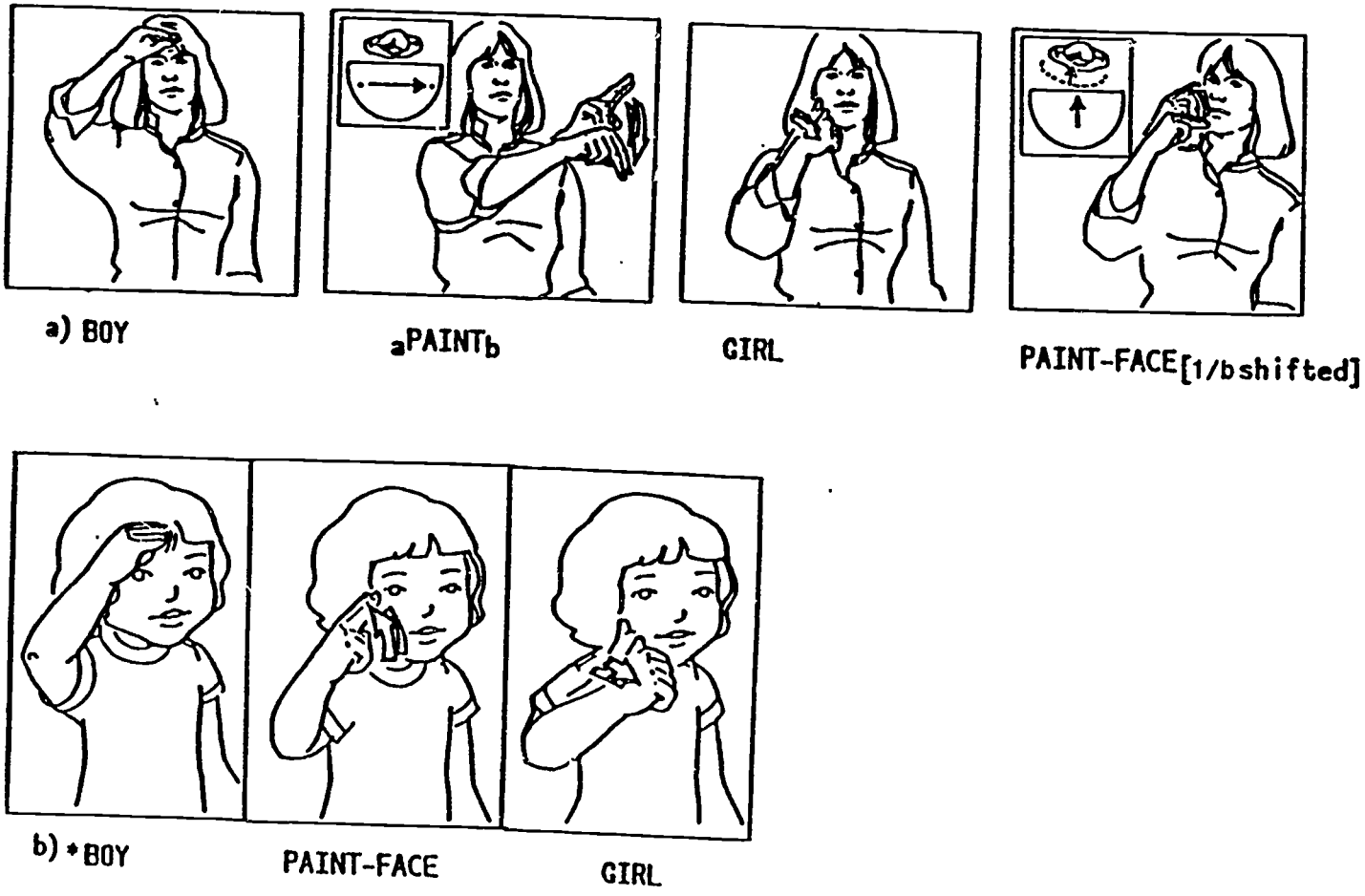


Figure 2 'The boy paints the girl's face' a) Correct signed version of sentence. b) Incorrect version signed by several children.

the children signed *BOY PAINT-FACE(right side) GIRL (figure 2b). For the girl painting the boy's face, these same children signed *GIRL PAINT-FACE(left side) BOY. That is, they used the right and left sides of the face to contrast the two referents. This is not correct in adult ASL.

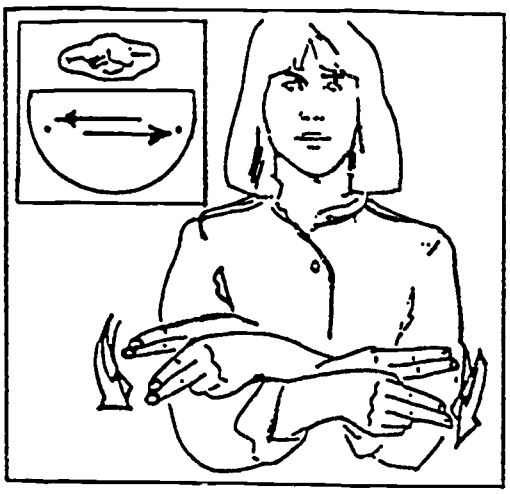
We also found the distinction used by some children with the verbs POUR and SPILL-OVER-HEAD; for example, 'The girl pours water on the boy's head and it spills over his head' was signed as *GIRL POUR-ON-HEAD(left side) SPILL-OVER-HEAD(left side) BOY. In addition, some children used what appeared, in context, to be a novel reciprocal form. ASL has a reciprocal form of the sign PAINT, but it is not possible to apply reciprocal morphology to the sign PAINT-FACE. Nevertheless, some of the children in our study did produce the novel sign *PAINT-FACE[Reciprocal] (figure 3).

These forms are especially interesting because of their novelty. Previous studies (Meier 1982) have documented overgeneralization of morphological forms by deaf children; these have taken the form of using existing morphological operations with inappropriate lexical items. Overgeneralizations of verb agreement, dual inflection and nominalizing morphology are all attested. The situation here, however, is rather different. There are no verbs in adult ASL which use different parts of the body for different referents. The children's forms thus do not represent simply overapplication of an attested morphological operation; they are completely innovative. At the same time, these forms do seem to be based on principles which underlie the spatial morphology of adult ASL. The children are evidently aware that distinctions in reference are generally indicated by means of some contrast or other in the spatial properties of the sign. The children are thus taking a basic organizational principle of ASL's spatial morphology and giving it a novel instantiation.

In terms of the overall course of development, these innovative forms first appear at about age 3; that is, at the age at which children have good comprehension of the system of nominal establishment (assigning referents to loci) (see Lillo-Martin et al., 1985), and only six months ahead of the age at which the acquisition of verb agreement is generally considered to be complete (Newport and Meier 1986). The children stop using these innovative forms approximately at age 5;6.

The question to be answered now is in what way the children's usage is incorrect from the point of view of the adult grammar. The children's signing in these narratives differs from the adults' in at least two ways: First, the children use verbs which could be described as 'intransitive' as if they were ordinary transitive verbs, and, second, they use morphological forms--the contrast between the sides of the head for different referents--which do not appear in adult signing. We will argue that these facts are related. We will first discuss the problem of transitivity.

Essentially, some of the verbs which, in the children's signing take overt nominal objects, cannot have such complements in the adult grammar. Verbs with incorporated body parts as objects, such as PAINT-FACE and SPILL-OVER-HEAD do not take overt noun phrases as



PAINT [Reciprocal]

*PAINT-FACE [Reciprocal]
'Paint each others faces'

Figure 3. Correct and novel reciprocal forms.

objective complements in ASL. While it is correct to sign 'The boy paints the girl's face' as BOY $_{a}$PAINT$_{b}$ GIRL PAINT-FACE[1/b shift], it is not grammatical to sign *BOY PAINT-FACE GIRL. The sign PAINT-FACE does not take an overt nominal as an object. Similarly, it is not grammatical, in the adult language, to sign *BOY POUR-OVER-HEAD SPILL-OVER-HEAD GIRL; the sign SPILL-OVER-HEAD never takes a noun phrase as object. Rather, the objects are already included in the verbs themselves, in the form of body classifiers.

The use of verbs which incorporate body classifiers has been partially described in Supalla (1982). With certain verbs, locations on the signer's body can be used to refer to equivalent locations on the referent's body. Supalla noted that different locations on the body can refer to different parts of the same referent, but not to different referents. "If subsequent verbs refer to another referent object, the signer must shift his body to a new place in the signing space in order to use it as another body marker [body classifier]; a second referent object cannot be marked by the body marker in the same location, even when nouns prior to the verbs make the distinctions between the two referents clear" (Supalla (1982) p. 32). In other words, verbs such as PAINT-FACE which incorporate body classifiers are marked for distinct referents by means of the system of Shifting Spatial Reference described above, and it is not permissible to assign different parts of the body classifier, such as the sides of the face and head, to distinct referents.

The children's use of verbs which incorporate a body classifier, such as PAINT-FACE and SPILL-OVER-HEAD, is thus unlike the adult usage in several ways. Until shortly after age 5, the children fail to observe the restriction that such verbs do not take separate overt objects, they omit the required use of Shifting Spatial Reference to mark different referents, and some of the children use the innovative verb forms described earlier. Yet it is interesting to note that in other respects, these same children have largely acquired the adult syntax. As stated above, verb agreement is generally considered to be fully acquired by age 3;6. The system of nominal establishment is fully comprehended by age 3, and in this study we found it beginning to be used productively by age 4;6. The use of Shifting Spatial Reference appears at or just before age 5 for some of the children. In general, then, the children have a good command of ASL's spatialized morphology and syntax.

It is interesting to note, however, that the children described in this study do not yet have mastery of the use of Shifting Spatial Reference with verbs incorporating body classifiers. Below the age of 5;6, we found no instances of the use of shifted reference with verbs such as PAINT-FACE and SPILL-OVER-HEAD, and numerous omissions of shift in contexts in which it is required--this despite the use of shifted reference in other contexts within the narratives. The indication is that the children below age 5;6, despite having largely acquired the adult syntax, have not yet fully mastered the use of verbs incorporating body classifiers. Their use of such verbs contains errors in complementation (the use of overt nominal objects) and referential marking (the omission of referential shift), and their incomplete understanding of the use of this class of verbs is

further exemplified by their incorrect assignment of different parts of the body classifier to distinct referents--the use of innovative morphological forms. As they learn the intricacies of this verb class, all of these errors disappear from their signing, including the innovative morphological forms.

In conclusion, the study of children's creative errors in the acquisition of this class of verbs provides insight into both the acquisition of ASL's spatialized syntax and into the acquisition strategies which children have available to them generally. In acquiring the spatial syntactic system of ASL, the children are faced with the problem of learning a class of verbs--the verbs incorporating body classifiers--with special requirements regarding complementation and reference. Until the interaction of this verb class with the morpho-syntactic sub-systems in the language (such as the system of Shifting Spatial Reference) is mastered, the children use these verbs incorrectly, but meanwhile make use of other linguistic devices which are available to them, such as word order and the innovative use of the principle of spatial contrast.

ACKNOWLEDGEMENTS

This research was supported in part by the National Institutes of Health, grants #NS 15175, #NS 19096, and #HD 13249; and the John D. and Catherine MacArthur Foundation Research Network on "The Transition from Infancy to Early Childhood." Illustrations were drawn by Frank A. Paul, copyright Ursula Bellugi, The Salk Institute. We thank Cheryl Fleck, Edward S. Klima, and Judy Reilly for helpful comments on this paper. We are very grateful to Dr. Henry Klopping and the staff of the California School for the Deaf in Fremont, California, as well as to the deaf children and their parents for their participation in these studies.

REFERENCES

Lillo-Martin, D., U. Bellugi, L. Struxness, and M. O'Grady,(1985) The Acquisition of Spatially Organized Syntax. Papers and Reports on Child Language Development 24, 70-78

Meier, R. (1982) Icons, Analogues and Morphemes: The Acquisition of Verb Agreement in American Sign Language. Ph.D. Dissertation, University of California, San Diego

Newport, E. and R. Meier (1986) Acquisition of American Sign Language. In D. I. Slobin (Ed.), The Cross-Linguistic Study of Language Acquisition. Hillsdale, NJ: Erlbaum.

Supalla, T. (1982) Structure and Acquisition of Verbs of Motion and Location in American Sign Language. Ph. D. dissertation, University of California, San Diego

PRCLD 26
1987

Children's Use of the Chinese Adverbial JIU

Rosalind Wu
Taiwan Provincial Institute for Schoolteachers' Inservice Education

Functions of jiu

The Mandarin character jiu (就) can function as a verb, an adverb, or an adverbial element with as many as 7-9 meanings. This report only deals with its adverbial functions. Incidentally, its use as a verb has not be found in the free speech samples we have collected from young Mandarin speaking children. As an adverb, jiu can denote either "immediately" or "only":

(1) Mama open jar cover, Little Star then fly out le.
媽媽打開蓋子　　小星星就飛出去了

(2) He only likes to sleep.
他就喜歡睡覺

Jiu can be used as an emphatic particle. In this case it receives special stress and the optional copula verb that follows becomes destressed as in:

(3) The birthday person (emph) is you.
生日的人就是你呀

According to Li and Thompson (1981) jiu is the most common backward linking nonmovable adverb in Mandarin. Typically, it occurs immediately after the topic of the second clause in a two clause sentence. In this capacity it marks the change in state in the second clause with respect to the time mentioned in the first clause. This changed situation can simply be a result of the passage of time. When this is the case the adverbial element is optional, for clause sequence by itself can denote time sequence. For example:

(4)Little Wei thought for a bit, then asked Mama.
小威想了一想就問媽媽

At other times, jiu can also shift the preceding clause into the hypothetical mode, therefore it figures very prominently in many conditional sentences.

I am interested in the development of children's use of conditional sentences because it implies the cognitive ability to deal with the hypothetical as well as cause-effect relationships. With this in mind we have chosen a subset of conditional sentences, those marked by jiu, to explore linguistic development.

Distinguishing conditional sentences from non-conditionals

In English, conditionals are introduced by "if" or "unless" but in Mandarin the markers are entirely optional. A conditional clause may be introduced by forward linking adverbs such as jiaru (假如) or dehua (的話) or ruguo (如果), or there might be no linking element at all. When no linking element is present there may be no formal distinction between a "when" and an "if" statement. It is the context that determines the interpretation of the sentence. In particular the context involves the knowledge about the situation which the speaker and hearer share.

In the ensuing analysis, we rely heavily on context to determine if a sentence containing jiu is a conditional sentence. In addition, we apply the "if" test: all sentences that are meaningful with the addition of (jiaru) "if" in the beginning are classified as conditional sentences.

Data from Spontaneous Speech Samples

We taped children's conversations from 20 different locations all over Taiwan, repesenting 20 cities and counties of the ROC. In each location we taped 8 children in pairs---one pair of 4 year olds, one pair of 5 year olds, one pair of 6 year olds and one pair of 7 year olds. In each case, children were left alone in a room, often the counseling room in school but sometimes in a home. There may be toys, books or any other utensils or equipment normally in the room. The children's teacher would leave them instructions to play and talk so that she could record some conversations for a project and then retire to a distance or leave the room altogether, for approximately half an hour.

Of the 160 tapes collected, some were of unusable quality. Among the usable tapes many contained dialects other than Mandarin (chiefly Min, with some Hakka). All were transcribed but only the tapes that contained solely Mandarin are included in this report. As can be expected the purely Mandarin samples come from the older children. The data reported here are for 14 four year olds, 18 five year olds, 14 six year olds and 20 seven year olds.

The number of sentences containing jiu produced per child increased with age, as shown on Table 1.

The functions of the sentences were determined from context, but this was not altogether successful. As we can see on Table 1 many of the sentences were

TABLE 1

Occurrences of Jiu Sentences in Spontaneous Speech

Age	# sentence with jiu	% Emphatic	% Conditional	% Temporal	% Unclassifiable
4 N=14	5	60·0	0	20·0	20·0
5 N=18	70	35·7	12·9	31·4	20·0
6 N=14	87	20·7	23·0	43·7	12·6
7 N=20	105	27·6	30·5	27·6	14·3

TABLE 2

Sentences Containing Jiu Repeated by Children

Sentences Type	Length	Sentence
Emphatic	12	我想養的就是天上的小星星
	12	你告訴我什麼，我就忘記什麼
	8	生日的人就是你呀
	15	他就是想不出為什麼鼻子上要打結
Conditional	9	想看它就要把燈關了
	10	死掉以後就不會發亮了
	11	放出來牠就飛到天上去了
	15	如果要記事情就在手帕上打一個結
	10	這樣就一定不會忘記了
	8	小狗說：那就可以了
	17	你在鼻子上打一個結就可以提醒自己了
Temporal	10	小威想了一想就問媽媽
	11	蓋子一開星星就飛出來了
	9	小狗一想就想出來了

impossible to classify. There were two reasons for the difficulty. Sometimes the sentences and clauses preceding the character jiu were only partly audible. At other times, the children did not provide any context and their intention remained ambiguous.

The data on Table 1 show that at age 4 use of jiu was mainly confined to its emphatic sense. However, at 5 years the conditional use is quite well marked. Its use continues to increase up till 7 years.

Our frustration with identifying the context and hence the functions of jiu in spontaneous speech samples led us to examine a second data source, in which the context and use is clearly specified and the issue is whether children's attempt to imitate sentences using jiu can reveal something about their understanding of its use.

Data from Story Repetition

The second set of data derives from imitations of 183 sentences that made up two stories, which children repeated after a teacher, one sentence at a time. The entire procedure was taped, transcibed verbatim on to computer and then analyzed. Embedded in the 2 stories were 14 sentences containing jiu. There were 7 conditionals, 4 emphatics, 3 time adverbs. Table 2 lists the sentences and their functions.

The subjects were 461 children, 21 from each of 22 cities and counties across the ROC with 142 four year olds, 160 five year olds and 159 six year olds.

We examined first whether jiu was omitted from the 3 types of sentences in different proportions. The data are shown on Table 3. An Age x Sex x Sentence Type ANOVA was performed on the percent of responses containing jiu for each sentence type. Sentence type was a within subjects variable. The results indicate a main effect for sex ($F(1,455)=4.27$, $p<.05$), but no effect of age and sentence type ($F(2,455)=2.09$ and $F(2,910)=2.22$, respectively). The main effect of sex showed that girls generally performed better than boys.

There was a significant age by sentence type interaction ($F(4,910)=4.21$, $p<.01$). It showed that while emphatic and conditional sentences included more occurrences of jiu in the older children's repetitions, the repetition of jiu in temporal sentences decreased with increasing age.

These data do not match our hypothesis that conditionals are cognitively more complex and therefore tend to be omitted in the repetitions. They do however, make sense. One would expect the emphatic jiu to be

TABLE 3

Percent of Responses Containing Jiu

Age	Sex	N	Emphatic	Conditional	Temporal	Total
4	M	70	50.0	50.4	54.8	53.59
	F	72	53.5	55.4	57.4	
5	M	83	52.1	53.4	52.6	54.36
	F	77	55.2	61.8	51.5	
6	M	81	59.3	59.4	49.8	56.32
	F	78	62.2	57.3	53.0	
All		461	55.5	56.4	53.1	

TABLE 4

Semantic Accuracy Scale

0 : No response or repetition of one or two isolated characters

1 : Incorrect Meaning or omission of key element of sentence

2 : Minor deviation from original meaning

3 : Accurate reproduction of sentence meaning

least often omitted since the teacher would emphasize it in reading. Furthermore, it matches the early occurrence of the emphatic use of jiu among 4 year olds.

Perhaps even 4 year olds are able to comprehend the hypothetical nature of conditional sentences and recognize the important role of jiu in emphasizing the change in state in the second clause. In contrast, when jiu functions only as a time adverb, the clause sequence adequately reflects the sequence of events and jiu is more dispensable.

A more detailed analysis of the children's repetitions shows increasing accuracy in transmitting the meaning of the sentences. In most child language research, errors are more revealing than correct answers. We scored the elicited imitations for accuracy in meaning on the 4 point scale shown on Table 4. Scores of 1 and 2 indicate incomplete or inaccurate representations of the original meaning of the sentence. A score of 3 indicates a minor deviation of the meaning of the sentence while a 4 implies exact reproduction of the sentence's meaning. An Age x Sex x Sentence Type ANOVA was performed on the mean semantic accuracy scores of each subject for each sentence type. No sex differences were found ($F(1,422)=2.03$, n.s.) but significant main effects of age and sentence type were found ($F(2,422)=22.4$, $p<.0001$ and $F(2,844)=157.54$, $p<.0001$, respectively).

Table 5 shows the mean scores for the three types of jiu sentences for the 3 groups of subjects. It reveals that accuracy increases with age and that emphatic sentences produce the best performance, conditionals the next best and time adverbs the poorest.

There was also a significant age x sentence interaction effect ($F(4,844)=3.5$, $p<.01$). It shows that accuracy in depicting the meaning of emphatic sentences remained much the same between ages four and six, the accuracy with conditional sentences improved significantly during these years and accuracy with temporal sentences increased most.

Conclusion

The data indicate that children as young as four years probably comprehend several different meanings of jiu but mainly use the emphatic meaning in their spontaneous speech. In the repetition study, sentences with time adverbs are simpler and shorter than sentences with conditionals. If the children did not grasp the conditional sense of the sentences beyond the time sequence, there is no reason why they would be

TABLE 5

Mean Semantic Accuracy Scores of Responses

Sentence Type / Age	Emphatic	Conditional	Temporal	All
4	2·43	2·13	2·42	2·33
5	2·50	2·22	2·62	2·45
6	2·66	2·45	2·82	2·64
All	2·53	2·27	2·63	

more likely to repeat jiu in the conditional sentences. Thus, the differences in repetition of jiu is an indication that the children can differentiate the conditional and temporal uses of jiu. The data also suggest more restricted experimental studies such as repetition studies can complement the collection of spontaneous speech data to give us a better understanding of children's language development.

References

Li, Charles N. and Sandra A Thompson (1981) Mandarin Chinese : a functional reference grammar. Berkeley: University of California Press.